PLASTICS

A Periodical Devoted to the Manufacture and Use of Composition Products

Vol. 5 **JANUARY, 1929** No. 1

Molded Products See Page 35

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East Engh.

PROBABLY this is as good a place as any, and now as good a time, to mention a little stumbling block we run across once in a while.

As you have read in this column before, a business paper such as PLASTICS can only function in proportion to its revenue, of which a major part is derived from advertising. The little wall we find set up for us now and then is the manufacturer who says, "Why everyone in this trade knows us. We don't need to advertise; it wouldn't do us any good".

Now we won't go into the obvious and oft repeated answers to this shallow reason for not advertising, but what we wonder at is how anyone can believe that fallacy in this fast growing industry.

Where an industry has been founded for fifty years or so, and the firms in it have been going along doing business with each other from time immemorial, where the trade has been handed down from father to son, where instead of progress and new ideas there is a stale, sanctified air of sameness and retrogression, then there may be some slight reason for saying, "Everyone knows us: no need to advertise."

But here we have a young, lusty, growing industry with continuous new blood and new conceptions galloping in and arguing for attention. Never have we seen an industry show greater possibilities for growth and expansion than this one. And with the new and ever expanding field opened up almost daily there is surely every reason to acquaint the trade with a timely sales message.

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PLASTICS
& MOLDED PRODUCTS

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PLASTICS

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Pressureless Molding of Resinoids

The art of casting fluid condensation products capable of setting to hand infusible products is disclosed in but a few patents among hundreds of others

By Charles W. Rivise

B. S. in Ch. E. LL. B., M. P. L.

CASTING has been defined as a process of molding without pressure, whereby a material in a liquid or molten state is poured or forced into a suitable mold and permitted to set and harden either by reducing the temperature below the fusing point or by reaction which takes place by virtue of which higher melting point bodies are obtained and solidification of the entire mass results. This process eliminates the use of the hydraulic press and is suitable for producing simple articles as well as bars or sticks of transparent material that can be afterward machined or otherwise mechanically formed into articles.

Requirements of a Casting Resin

A plastic to be suitable for casting must be capable of melting without decomposition, must have good flowing qualities, should be capable of showing the details of the mold clearly with little or no pressing, should be able to retain without further treatment the form given to it while hot and must be capable of hardening under the influence of cooling or further heating without becoming porous. From the above considerations it would be expected that most of the artificial plastics cannot be employed for casting. In fact a careful study of the Patent literature of the artificial resins numbering about 1500 United States patents reveals but a mere handful that have even a few of the properties necessary for a good casting resin.

The comparative simplicity of casting as applied to some of the common metals, and as developed to a fine art in die-casting aluminum, and zinc alloys, has prompted investigations into the possibilities of casting resinoid materials, so that the expensive equipment involved in hydraulic press installations might be avoided. With the exception of some very fine transparent and translucent art obojects, not very much has been accomplished and future investigators can here find a fertile field for the exercise of their inventive skill.

The essential features of a good casting resin comprise the ability to set to an infusible mass without the formation of bubbles or the increase or decrease in volume. Thus far there has been no resin that would set rapidly and the known processes all require many hours to weeks to cure the resin in the molds.

The phenolic condensation product known as Bakelite ordinarily becomes porous unless great pressure is employed during its hardening. However, a method is in use that enables this product to be cast. This method consists of mixing the form "A" of this resin in liquid, pasty or solid form with dyes or coloring matters and subjecting the product to heat with or without pressure preferably with agitation until the mass begins to solidify, when it is poured into molds and the reaction allowed to go on without external heat or pressure. The product which is now in form "B" may be removed from the mold and stored away or subjected to the final treatment which consists of heat with or without pressure.

In the following abstracts are given the methods of making not only all the artificial resins down to December 31, 1927 specifically stated to be suitable

for casting but also those resins that appear to have at least some of the properties necessary for casting. The abstracts are divided in two groups (1) Resins of the Phenol Aldehyde Type and (2) Miscellaneous Resins.

Resins of the Phenol Aldehyde Type

F. G. Wiechmann, Patent 1,080,188, Dec. 2, 1913.

Crystallized phenol or carbolic acid or any of its homologues or mixtures thereof is mixed with paraform in the form of a dry powder, or with any dry or condensed form of formaldehyde and the mixture is heated in the presence of dry ammonia gas. The product may be mixed with fillers such as wood pulp, asbestos, protein, vegetable or animal albumen, cellulose, abrading materials, sulphur or rubber each alone or with coloring materials or bleaching agents, or the product may first be heated to intermediate stage before the incorporation of the fillers at which stage the product is said to be suitable for molding with or without pressure.

H. Stockhausen & R. Gruhl, Patent No. 1,150,642, August 17, 1915.

Phenol and formaldehyde or their equivalents are heated together with or without a condensing agent such as caustic soda lye. As soon as the clear liquid becomes turbid the interaction is interrupted by means of cold water. The intermediate soluble product is mixed with ferric chloride or aluminum chloride in molten form and the water removed by kneading or rolling. Rubber and sulphur as well as minerals, flakes of mica, powdered mica, powdered marble, fibrous materials such as cellulose fibers, woolen, cotton and asbestos fibers, cotton, wool, paper or cork may be incorporated into the intermediate product. The product may be rendered infusible by the means of heat alone and should therefore be suitable for casting if it can be rendered fluid enough for pouring.

W. A. Beatty, Patent 1,225,748, May 15, 1917.

The patent discloses a gum which when made acid in reaction with an acid such as hydrochloric, sulphuric, or benzene sulphonic acid can be hardened by heat alone or even by being allowed to stand. The gum can be made by dissolving dioxy-diphenyldimethylmethane in formaldehyde and adding an acid or base preferably an alkali, or an alkaline earth hydroxide or a salt having an alkaline reaction to produce condensation. Sodium hydroxide, ammonia and amines are specifically mentioned as possible condensing agents. A variation is to add powdered hexamethylenetetramine to the melted dioxy compound and heat until ammonia is evolved.

The dioxy compound may be made by allowing a mixture of phenol, acetone and hydrochloric or sulphuric acid to stand together. The resultant product should be purified by washing with dilute acetic acid and if necessary recrystallized from hot water.

K. Brown & D. S. Kendall, Patent 1,263,031, April 16, 1918.

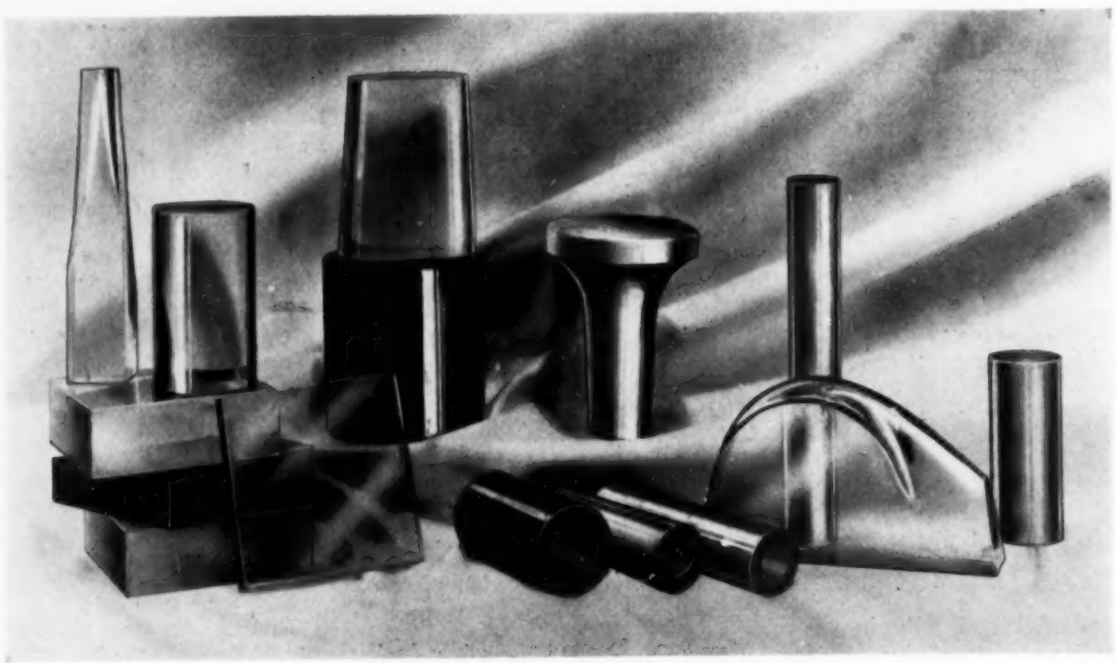
Liquid anhydrous phenol or cresol and a paraformaldehyde preferably trioxymethylene are dissolved in a vessel having a suitable proportion of heating surface to contents, the trioxymethylene being present in somewhat greater than equimolecular proportions. Compressed balls of calcium phenolate or cresolate may be suspended in the solution by means of wire cages to act as a catalyst and heat applied. The reaction is stopped at the intermediate stage by means of a water jacket. The product can be hardened by means of heat alone.

Redman, Weith & Brock, Patent 1,310,087, July 15, 1919.

A solution of formaldehyde is boiled together with a phenolic body such as phenol, ortho, meta or para cresol taken largely in excess of the formaldehyde at atmospheric pressure until the formaldehyde is substantially eliminated from the supernatant aqueous layer. The aqueous layer is then discarded and the gummy mass is mixed with a solution of formaldehyde and a very small proportion of hexamethylenetetramine. The mass is concentrated below 100°C. The molded article is removed from the mold and hardened by being subjected to prolonged heat treatment below 100°C. either at, below or above atmospheric pressure and to final heating for a short time above 100°C.

The color may be varied by introducing suitable coloring materials during the second step of the process. For example auramine may be used to produce a deep amber, methyl violet to produce amethyst and acetyl red, to produce "dregs of wine". Oils and waxes may be introduced to produce opaque materials and ground mica or fish scales to produce shimmering effects.

In Patent 1,345,694 dated July 6, 1920 a variation is described wherein the additional formaldehyde is added to the mass after it has been concentrated by boiling above 100°C. and then cooled below 100°C.



Some excellent examples of what can be accomplished in the line of cast phenol resinoids. Note the transparent effects.

Photograph by Courtesy of Bakelite Corpn.

In Patent 1,374,526 dated April 12, 1921 another variation is described wherein the starting mixture contains equal parts of phenol and formaldehyde.

I. Pollak and E. Mohring, Patent 1,475,446, Nov. 27, 1923.

One molecule of phenol and more than one molecule of formaldehyde are caused to react in the presence of a weak organic acid such as a mono- or poly-basic carboxyl acid preferably salicylic acid. After the resin sparates a quantity of a base such as mono- di- or trimethylene or other methylene body and a small amount of ammonia are added sufficient to slightly exceed the point of neutralization. The resin should be washed and distilled in vacuo. The product can be hardened by means of heat alone.

W. Achtmeyer, Patent 1,599,627, Sept. 14, 1926.

Phenol and formaldehyde are condensed in the presence of a mineral acid ester such as those of amyl, methyl or ethyl alcohol especially the hydrochloric acid ester to produce a resin that can be hardened without the use of pressure. The product in viscous form may be thinned down with an alcohol such as wood or grain alcohol and mixed with solvents of low volatility such as acetanilide, certain essential oils containing phenolic compounds or esters of phenols, cresols and naphthols and especially with an alcoholic solution of thymol.

Miscellaneous resins:

Griscom, Patent 529,728, Nov. 27, 1894.

Animal fat candle tar which is the residual product from the distillation of animal fats, oils, etc., is mixed with an equal weight of petroleum residium and heated in a steam jacketted kettle at a temperature of about 300°F. Melted sulphur is then poured in and the temperature is gradually raised to about 345°F. and mass may be allowed to cool and then can be cut up into blocks or lumps.

Goldsmith, Patent 840,931, Jan. 8, 1907.

Casein or a derivative thereof is treated with a converting agent such as alpha-naphthol, beta-naphthol, benzoic acid, carbolic acid, hydrochinon, cresol, pyracatechin, resorcinol, salicylic acid or urea in its natural state or dissolved in alcohol or water. The softness and thermoplasticity is said to depend upon the particular converting agent employed. See also Patents 964,964; 965,137; 1,027,121; 1,027,122; 1,076,417 and Reissue 14,087 issued to Goldsmith on methods of making plastics similar in character to that of the present patent.

Lilienfeld, Patent 1,037,158, Aug. 27, 1912.

Invention is directed to treating fats, fatty acids or drying oils, particularly Chinese wood oil or the fatty acids of wood oil, or their derivatives or esters derived from fatty acids and higher alcohols, for example lanolin, with amido derivatives or hydroxyl derivatives of aromatic hydrocarbons or with transformation products of either of these classes of products in the presence of condensing agents such as zinc chloride or aluminum chloride to produce a product that can be vulcanized by means of sulphur or sulphur chloride. The amido or hydroxyl derivative may be aniline, orthotoluidine or resorcinol. The condensation may be in the presence of glycerine and fillers such as acetylcellulose, viscose, glue, albumen or starch may be added.

M. J. Callahan, Patent 1,091,627, March 31, 1914.

A mixture of equimolecular proportions of malic acid and glycerol is gradually heated in a receptacle until active ebullition sets in. The product which is a malic acid ester of glycerol may be mixed with brittle resins such as the condensation product of glycerine and phthalic acid or with camphoric acid resins. The glycerine may be replaced with other polyhydric alcohols such as glycol or mannitol. Heating below its melting point converts the product into its infusible form.

M. J. Callahan, Patent 1,091,628, March 31, 1914.

Equimolecular proportions of a polyhydric alcohol such as glycol, glycerine or mannitol is heated until a sample upon cooling is hard and brittle without stickiness. The product may be mixed with resin made as in Patent 1,091,627 and is rendered infusible by means of heat

M. J. Callahan, Patent 1,091,732, Mar. 31, 1914.

A mixture of a polybasic acid of the aliphatic series such as succinic acid, tartaric acid, pyrotartaric acid, citric acid and a polyhydric alcohol such as glycerol or glycol is heated until a viscous product is formed. Phthalic anhydride may be substituted for part of the aliphatic acid to increase the strength of the product.

K. B. Howell, Patent 1,098,728, June 2, 1914.

A polybasic acid such as camphoric acid, cinnamic acid, citric acid or an anhydride such as phthalic anhydride is heated in an open retort with a polyhydric alcohol such as glycerine, glycol or mannitol, both the acid and alcohol being in molecular proportions to form a basic ester. Then castor oil is added to form a product which can be rendered infusible by heat alone without becoming porous.

Wm. C. Arsem, Patent 1,098,776, June 2, 1914.

Glycerine or other polyhydric alcohol is heated with phthalic anhydride to form a fusible mass. Then a weighed quantity of napthalene or anthracene is added to the melted mass to retard premature hardening of the mass. Monochlornaphthalene or tetrachlornaphthalene as well as the substitution products of anthracene may be used. The product may be rendered infusible by heating at from 190° C. to 250° C. for several hours or at 135° C. to 150° C. for several weeks.

A. Eichengrun, Patent 1,185,074, May 30, 1916.

A composition which retains without further treatment the form given it while hot is made by mixing and heating acetyl cellulose, acetyl methyl anilide, ethyl ester of lactic acid, alcohol and benzene at about 70° C. Filling materials such as zinc white, mineral, metal or vegetable powders, graphite or lampblack may be added.

Wm. C. Carter, Patent 1,251,862, Jan. 1, 1918.

A polymerizable oil such as China wood oil is mixed with a thick liquid consisting substantially of sulphonates derived from the so-called acids of wood tar or coal tar or both, or the sulphonates derived from benzol, naphthalene, phenols, naphthols, or cresols. The product should be washed, and neutralized by means of borax, silicates, phosphates, red oxide of iron or rosin soap of aluminum. Fillers may be incorporated as is usual in the art.

Wm. C. Carter, Patent 1,251,863, Jan. 1, 1918.

Invention differs from that disclosed in Patent 1,251,862 in that the China wood oil prior to its being mixed with the sulphonates has added to it a convertible or vulcanizable diluent such as tar acids, sulphonates derived from tar acids or other fluid benzol derivatives containing a free hydroxyl or sulphonate group. Formaldehyde or hexamethylene-tetramine is added before washing the product.

M. John, Patent 1,355,834, October 19, 1920.

An aldehyde such as formaldehyde and urea (carbamide) or thiourea (thiocarbamide) are heated in a still without any condensing agents to form a glue-like product. Benzoylcarbamide or acetylcarbamide may also be employed. The product can be hardened by means of heat alone.

C. E. Swett, Patent 1,365,607, Jan. 11, 1921.

The alcohol soluble proteid of maize or Indian corn called zein, a resin such as rosin or copal, a phenol such as carbolic acid or cresol and a solvent such as alcohol are mixed to form a product which can be molded by means of heat.

F. Pollak, Patent 1,458,543, June 12, 1923

Urea, thiourea or a derivative thereof is dissolved in formaldehyde in the presence of a condensing agent such as pyridine or ammonia, the latter of which may be in the form of hexamethylene-tetramine. When the solution is completed it is boiled and the product is distilled in a vacuum. Dyes and fillers such as wood pulp, asbestos, chalk, Plaster of Paris, carborundum or sand may be added.

K. Ripper, Patent 1,460,606, July 3, 1923.

The invention is directed to stabilizing a urea-formaldehyde condensation product by means of salts showing an alkaline reaction on hydrolysis. The specific salts mentioned are sodium acetate, and sodium borate. The hardening of these stablized products

(Continued on page 24)

Cheaper Raw Materials Essential for Expansion

Future development of large scale molding and the use of plastics for structural objects depends on a supply of inexpensive raw materials. How synthetic methanol points the way to cheaper phenol and formaldehyde

By Carl Marx
Editor of Plastics

IN the manufacture of practically every type of plastic materials, some form of solvent is an indispensible adjunct. Solvents are employed either for the purpose of enabling the spreading of the plastic material, as in the manufacture of films and lacquers, or they are employed as media by means of which the various plasticizers and softeners are introduced into the plastic.

Synthetic Methanol

Some of the solvents also may be employed as the starting point of materials that go to form the plastics themselves, or they form the means for impregnating cloth, fabrics, paper, wood flour, etc., with the resinous materials in the manufacture of molding powders, laminated sheets, etc. Among some of the useful solvents that also are a raw material for the manufacture of resinoids is methyl alcohol, properly called methanol, CH_3OH. This not only is an excellent solvent in itself but also forms the starting point for the manufacture of formaldehyde CH_2O, as all that is necessary to transform methyl alcohol into formaldehyde is simply the addition of oxygen, thus:

$$CH_3OH+O=CH_2O+H_2O$$

Practically all the formaldehyde used in the production of the various types of resinoids, such as the phenol-formaldehyde resins, the urea-formaldehyde condensation products, the hardening of casein solids, and the hexamethylenetetramine used as a hardener for the phenolic resins, is derived from methanol by oxidation. It is obvious therefore that any method that will serve to reduce the cost of methanol must have its effect on the cost of formaldehyde and hence on that of the plastic materials. It is from this point of view that the synthesis of methanol, first accomplished on a commercial scale in Germany is of considerable importance to the plastic industries.

In the early days of the thermo Plastic materials, cost was a minor consideration, but to meet the undoubted enormous demand of the near future, when we can expect entire interior furnishings and trim to be made of molded products, basic raw materials such as coal, water, lime stone and air will form the basis of these materials.

The old method of making methanol (or wood alcohol as it used to be called) was by the destructive distillation of wood, whereby volatile products such as acetic acid, methanol, and a residue known as charcoal is produced. In the United States this distillation of wood is a very important industry. A few years ago, when the first synthetic methanol was imported into this country from Germany, a great cry was raised that the wood distillation industry was doomed to destruction. Fortunately this Cassandra cry was not strictly prophetic, and the industry is still holding its own, although the prices obtainable for methanol are not as great as they were before this new competitor, synthetic methanol, came into the field.

Alcohol From Hydrogen and Coal Gas

What the German chemists have accomplished is the synthesis of methanol by taking two cheap and available gases, hydrogen and carbon monoxide, and compressing them and heating them in the presence of a substance that, without losing its efficiency or being used up in the process, will cause the gases to unite to form the desired methanol. The substances used to bring about this change are called catalysts. The reaction that takes place when carbon monoxide, which is the common "coal gas" that burns with a blue flame on top of a furnace fire, and hydrogen combine can be illustrated roughly by the equation:

$$CO+2H_2=CH_3OH$$

Thus it will be seen that the reaction is a straight out and out synthesis. The yields obtainable are of course determined by the conditions, as the reaction tends to go the other way also, which is to say that the methanol formed tends to resolve itself again into the gases CO and $2H_2O$. In actual practice

(*Continued on page 24*)

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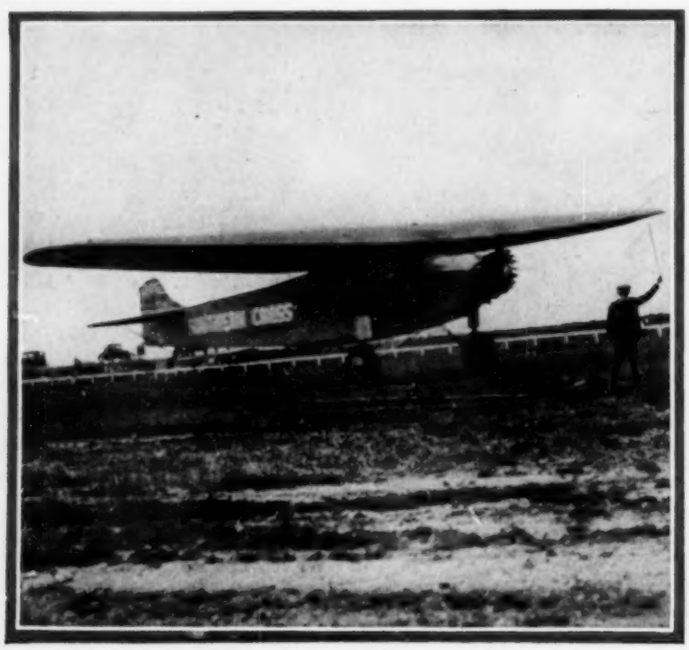

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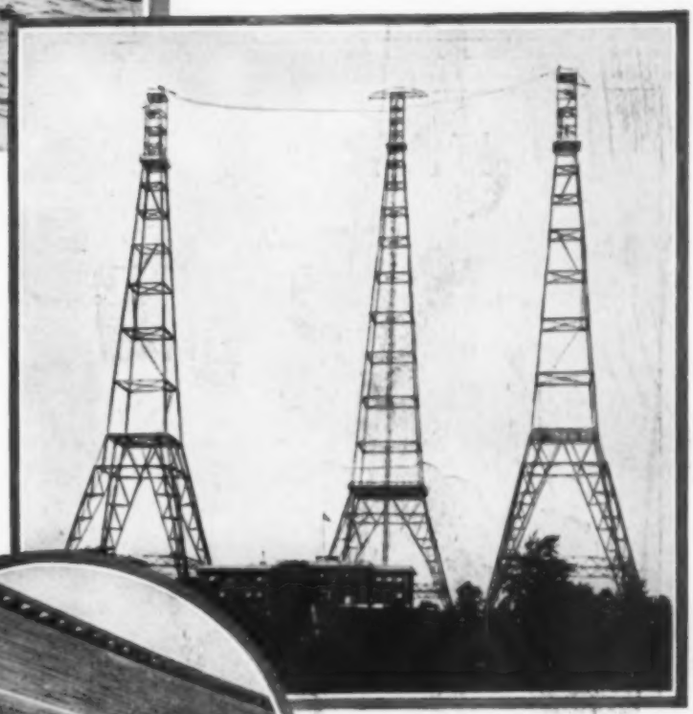

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How Striking Mottled Pearl Effects Are Attained

Use of pearl essence, containing fish scales, in pyroxylin plastics, when properly manipulated gives rise to a very pleasing article. Details of method described.

THE desire to produce good imitations of mother of pearl led to the use of fish scales. In the past these were either applied as a lacquer or worked into the plastic itself, being simply mixed with it more or less indiscriminately. The Higgins process taught the art the development of more interesting effects. The present process aims to produce a sort of pattern that further enhances the beauty of the finished goods.

THE vogue for "pearl effects" and other similar striking plastic products has caused many inventors to use their ingenuity to produce variegated designs in the finished plastic. It is apparent that there are quite a number of ways in which this can be accomplished, and the various "pearl effect" patents have been described from time to time in our pages.

Recent DuPont Process

A recent patent covering this field, the first one for quite some time, is that of John H. Clewell, of Arlington, N. J., who assigns it to E. I. DuPont de Nemours & Co., of Wilmington, Del., being U. S. P. 1,675,642; July 3, 1928. As the process discloses some novel features that can only be readily understood by reference to drawings, we reproduce the entire set of 11 figures and enough of the patent specification to show how the inventor accomplishes his purpose.

The sizes of the pearl essence crystals and the thickness of the layers are exaggerated for the sake of clearness, and the various figures are not to scale either actually or with respect to each other.

In the drawings:—Figure 1 is a fragmental plan view of cast cellulose ester film containing pearl essence, with individual crystals of essence shown, but it will be understood that this showing of individual crystals is but for illustrative purposes, it being the fact that actually the crystals are not individually discernible but are closely distributed throughout the plastic, giving a peculiar sheen to the film; Figure 2 is an edge view of the film; Figure 3 is an elevation of cut films stacked ready for welding into a block; Figure 4 is an elevation of a block showing a sheeting operation; Figure 5 is a plan of a sheet from the block shown in Figure 4; Figure 6 indicates the cutting of certain of the sheets (Figure 4) into irregular pieces; Figure 7 is an elevation showing the stack for a second blocking and pressing operation; Figure 8 illustrates in plan the laying up of the pieces (Figure 6) in the press; Figure 9 illustrates the sheeting of the block (Figure 7); Figure 10 is a plan or face view of the finished produce; and Figure 11 is a view illustrating a modified procedure. In Figures 5, 6 and 8, for the sake of simplicity, the crystals of pearl essence are shown merely by single lines, rather than as in Figures 1 and 10, but it will be understood that in these figures, as in Figures 1 and 10, the crystals are viewed flatwise, all of the figures being plan views.

Film Cut Into Pieces

Briefly stated, the invention preferably comprises the following steps: casting a film of cellulose nitrate having pearl essence distributed therethrough; cutting the film into sheets, stacking the sheets, and welding them into a block under heat and pressure as in a standard cake press, and sheeting the block horizontally, cutting certain of the sheets into irregular pieces, stacking the material for a new block by alternating full sheets and layers made up of the irregular pieces; forming the stack into a block and sheeting it horizontally or cutting it into rods or other desired shapes, to give the product. In this procedure the casting of the film gives the primary orientation of the pearl essence particles, and the use of the irregular pieces and their arrangement gives a secondary orientation, as explained in detail below.

Further Details

In detail, the procedure outlined above may be as follows:

A colloidal solution of pyroxylin, camphor and volatile solvent is prepared in any of the ways common to the film casting art. Such a solution has the consistency of a syrup, as distinguished from the relatively solid character of the plastic masses usual for use on the rolls in the usual process of making pyroxylin plastic, and is

usually called a "dope." To this dope is added the pearl essence and such coloring materials as desired in any particular case, and the mixture stirred until homogeneous. By way of illustration the casting composition may be (parts by weight)—

Pyroxylin	100.
Camphor	37
Urea	.5
Pearl essence (dry basis)	.42
Acetone	350
Butyl alcohol	20
Denatured ethyl alcohol	30
Coloring material as desired.	

art. The proportion of urea (stabilizer) may be considerably varied, of course. Upon the amount of solvents used depends the viscosity of the dope. The kinds and exact proportions of volatile solvents are not important, for example, methyl alcohol, butyl acetate, and ethyl acetate are all possible ingredients. In fact any suitable composition in the pyroxylin film casting art is satisfactory. The coloring matter may be added to counteract the natural yellow cast which the pyroxylin has and to impart

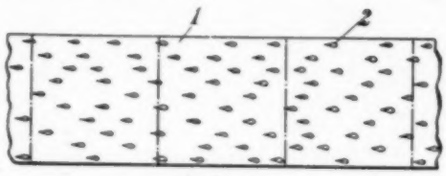


Fig. 1

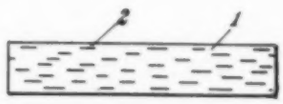


Fig. 2

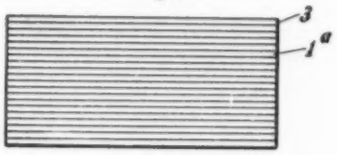


Fig. 3

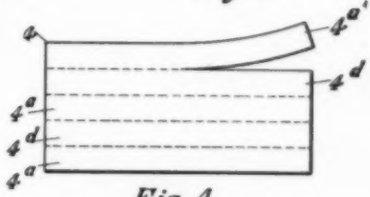


Fig. 4

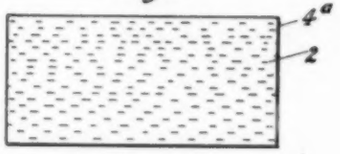


Fig. 5

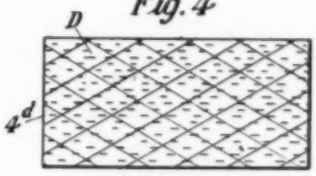


Fig. 6

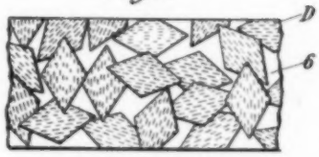


Fig. 8

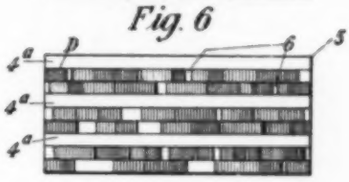


Fig. 7

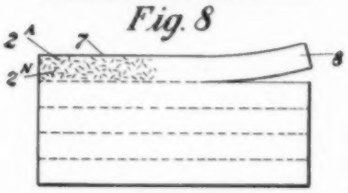


Fig. 9

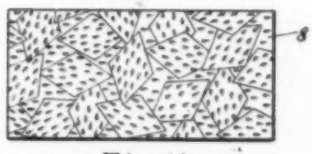


Fig. 10

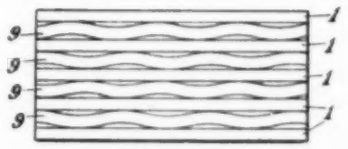


Fig. 11

The above figures illustrate the process of making variegated pearl sheet from pyroxylin plastics.

The ratio of the ingredients can, of course, be considerably varied, for instance, the camphor may be varied from 30 to 50 parts per 100 of pyroxylin as in the ordinary pyroxylin plastic thereto a blue-white color. The colors should be fast and the amounts and kinds may be varied to give the shade desired. For example, the following may be used per 100 parts of pyroxylin; ultra-marine .004 parts, and alizarine purple lake B .006 parts. The proportion of pearl essence may be somewhat varied depending upon the exact effect sought, cost, etc., but the proportion given has been found preferable, all factors considered.

Pearl essence is always supplied to the trade mixed with a liquid, and since the essence is added to the dope while the essence is in this condition it is important that the liquid be compatible with the pyroxylin and the solvents. Practically any liquid that is a solvent for pyroxylin and is compatible with the essence will serve.

Removing Air Bubbles

The casting dope, having been thus prepared and having been evacuated (as in a suitably equipped tank) to remove air bubbles, is now cast into a film of indefinite length and any desired width. The thickness of the film may be varied at will without affecting the result; a thickness of .005 to .020 inch being suitable. In casting, the dope is flowed out, as by gravity, through the narrow slit of a casting hopper on to a suitable casting surface, say the periphery of a polished nickel casting wheel or drum, the wheel moving under the hopper during casting. The major feature of this casting step in the present connection is that the thin flat crystals of pearl essence become oriented as the dope flows through the narrow slot-like orifice on to the casting surface, and as the dope lies in liquid condition on the surface.

The freshly cast film is dried to a point where it can be stripped (e. g. 12 to 20% liquid solvent) and is then stripped from the casting surface. The resulting film 1 is conventionally indicated in Figures 1 and 2, the particles of oriented essence in the same being indicated as 2. This film possesses a pearly lustre but this is flat and lacks the contour and mottling which are necessary to a proper re-

(*Continued on page 32*)

Styrol Products Now Suitable For Molding

Perfectly clear products direct from hydrocarbons. Ingenious method of overcoming difficulties in powdering the products is disclosed by the inventor

Iwan Ostromislensky

The peculiar nature of the styrol hydrocarbon renders it available for polymerization directly into resinous products. Various types of styrol resins described.

It appears as though these materials show considerable promise of wide utility.

DURING the past year we have heard of the glass-clear condensation products prepared from a substance that to many had a strange-sounding name. It was Styrol, and it could be turned into products as clear as glass, even transmitting ultraviolet light, and which could be used as plastics.

Most of the work in this new field was that of Iwan Ostromislensky, a very well known rubber chemist, who has apparently been conducting his research on behalf of the Naugatuck Chemical Co., of the town of that name in Connecticut, for all of the patents thus far issued are assigned to this company.

Some more of this work has now become public, and several closely allied patents issued during the Summer and Fall of the past year, though their application dates go back four years or more. We have already published several articles on this work.

Polymerizing the Styrol While In the Form of An Emulsion

The first of these patents concerns a new method of making powdered styrol polymers suitable for molding. The styrol products are clear as glass, but very tough and virtually impossible to grind into powder. The inventor however gets over this difficulty by a most ingenious method that involves polymerizing the liquid styrol while it exists as extremely minute droplets in an emulsion, so that, after the polymerization he can separate these individual droplets, that are now in resinoid form, as a white powder.

Before proceeding with the description it might be worth while to consider what styrol is and where it is obtained. Styrol is a hydrocarbon that can be separated from petroleum (crude oil) by a cracking operation, especially when the same is carried out in an inert atmosphere. Styrol has a formula of $C_6H_5.C-H=CH_2$, being a hydrocarbon having a double bond between two carbons. The compound therefore has at least one methylene group and hence is very reactive and capable of condensing with itself or, as it is called, to polymerize to form a large complex molecule, known as meta styrol. As is usual under such circumstances, the molecule soon assumes colloidal dimensions and thickly fluid, then plastic and finally solid bodies result.

The last patent of this group describes methods for the preparation of the styrols themselves and hence nothing further need be said at this point.

The first of these patents, 1,676,281; July 10, 1928, as already indicated relates to the preparation of powdered polymerized styrol.

In carrying out the invention in its preferred form, 33 1/3 grams of substantially pure styrol are emulsified by stiring with 66 2/3 grams of aqueous ammonia, specific gravity approximately 0.959, and 1 gram of oleic acid. Stirring is continued, 10 to 20 minutes, at the end of which time an emulsion of the styrol occurs. The resulting emulsion is heated preferably in an air-tight container to 140° C. for 12 to 24 hours. During the first hour of heating the mixture should be stirred several times (say three) otherwise there is danger of the emulsion partially breaking. As a result of this treatment a very mobile milky liquid is produced which closely resembles rubber latex and contains finely divided vitreous polymerized styrol suspended or dispersed in a non-solvent containing the reaction product of the ammonia and the oleic acid. To this suspension is then added 800 cc. of methyl alcohol (95%) in which the polymerized styrol is substantially insoluble, and there then is precipitated as a very fine snow-white dust vitreous polymerized styrol containing a small amount, from .01 to .5%, of the reaction product of ammonia and oleic acid. This material is then filtered and carefully washed first with hot water and then with small amount of methyl or ethyl alcohol or similar material, after which it is dried in any convenient manner such as by air heated to a low temperature or otherwise is desired.

Various other materials may be used as emulsifying agents instead of oleic acid. For example palmitic, stearic and sim-

ilar soap-forming fatty acids may be so employed, and these materials will appear in small amounts in the resulting products. These materials may be added in amounts varying from 1-10% approximately. The temperature for polymerizing may be varied within the limits 130° to 175° C. and the time may be correspondingly varied for 90 to 10 hours. Instead of using methyl alcohol, ethyl alcohol or acetone may also be used as well as sulphuric or acetic acid or barium chloride solution, preferably containing about 1% barium chloride.

Products Mold Readily

In general it may be said that all coagulating agents for rubber latex have this effect and may be used. Indeed the dispersion resembles rubber latex in many respects.

Various other substances, for example, those soluble or readily dispersed by water, as for example, gelatine, gum arabic, starch, agar agar, etc., may be mixed with the dispersion of polymerized styrol. Such combinations may be coagulated in a manner similar to that mentioned for the coagulation of the uncombined dispersion, and thus give homogeonous mixtures of vitreous polymerized styrol and gelatine, etc., in precipitated form.

The products of the coagulation of such polymerized dispersions are dried either at ordinary temperatures or at elevated temperatures, with or without a vacuum and molded in a plunger mold at temperatures between 120-175° C. as described in copending application of Ostromislensky and Shepard, Serial No. 711,588, filed May 7, 1924.

The emulsified and powdered products may be readily mixed with various other powdered materials for example pigments such as zinc oxide, cadmium sulphide, mercury sulphide, etc., to form homogeneous mixtures.

For example 100 grams of the coagulated and dried vitreous polymerized styrol powder are

mixed in a mortar with 15 grams of zinc oxide and then molded as above.

Instead of employing styrol as the material to be emulsified and polymerized, various other materials and their homologues may be employed with similar results. Such homologues include ortho- and paramethylstyrol, symmetrical meta-metadimethylstyrol, etc.

The next group of patents are closely related, the first one covering the methods for the re-use of scrap and trimmings of the polymerized product. According to this patent, U. S. P. 1,683,401; Sept. 4, 1928, 5 parts of unpolymerized liquid styrol are added to 95 parts of non-homogenous tough transparent polymerized styrol, whereupon the mixture is heated at 180° C. for 3 hours preferably in a vessel provided with a reflux condenser open to the atmosphere, though a closed vessel may be employed if desired. At the end of this time a substantially homogeneous mass of polymerized styrol results. During the course of this process the small amount of liquid unpolymerized styrol added is polymerized. During the process practically no boiling of the styrol occurs because it is absorbed rapidly by the polymerized styrol. The resultant product is a substantially homogeneous tough transparent polymerized styrol. It will have the general shape of the polymerizing vessel, and being free from bubbles is ready to be fashioned on a lathe, or otherwise machined, or to be extruded, or treated as desired to produce an article free from bubbles and like defects.

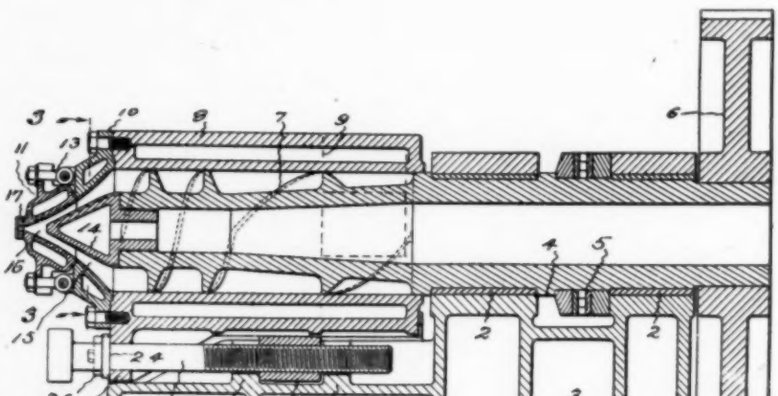
Using Up Scrap

As another example of the invention a mixture of shavings from tough transparent polymerized styrol or powdered tough transparent polymerized styrol and various odds and ends left over from the machining of this material which may contain various admixtures such as coloring materials, zinc oxide, etc., is dissolved in substantially pure styrol, the amount of the solvent being varied from 15 to 60% based on the weight of the tough transparent polymerized styrol taken. From the resulting solutions such admixtures as are insoluble in styrol, zinc oxide, insoluble colors, etc., are filtered off, whereupon the solution may then be polymerized by subjecting it to 180° C. for 8 hours. following the procedure given in the preferred example above. All of the above mixtures of styrol and non-homogeneous polymerized styrols when polymerized under the conditions set forth are substantially free from unpolymerized styrol.

The next three patents must be considered together as they

Extrusion Press for Plasticizing Materials and Orienting Their Particles

A PLASTIC extrusion press of a type that while described primarily in conjunction with the working of rubber-containing plastics, nevertheless appears to be perfectly adapted, with perhaps slight mechanical modifications, for the working of casein solids and similar types of plastics in which orientation of the particles is an important factor, is covered by a patent issued Aug. 28, 1928, to the Farrell-Birmingham Co., of Ansonia, Conn., on an application of William A. Gordon, U. S. P. Re-issue 17,070 (of original patent 1,608,980 of Nov. 30, 1927.)



As will be seen from the illustration, the press is of the familiar "meat-chopper" type and comprises a central worm that gradually propels the material forward, while at the same time compressing the same. The novel features lie in the adjustable end-chamber. The change in volume in this chamber is brought about by mounting the housing for the worm on gibs (19) and providing threaded screws (21) so that the housing may be moved co-axially with the worm, so that the chamber (16) may be made larger or smaller. To prevent the material from sticking in the machine, the covering of the chamber 16 is jacketed. Of course the jacket may be used for heating as well as cooling. The mechanical work done on the material while traversing the press warms the same and makes it plastic, and the material issues from the press through the nozzle (17) in a continuous stream, in any desired form depending upon the shape of the nozzle. 15 claims cover the machine.

all relate to methods of making particular types of polymerization products. It appears that styrol can be polymerized into three different kinds of product. The first, called alpha meta styrol is vitreous tough and moldable; the second, made at a somewhat higher temperature is more brittle and is known as beta meta styrol, while a third or highest state of polymerization bears the designation gamma meta styrol. The three patents cover the three modifications in the order stated.

U. S. P. 1,683,402; Sept. 4, 1928, describes all the meta styrols and claims the alpha. As this patent contains some general statements applicable to all the styrol compositions we quote rather fully from it.

Styrol polymerizes to a substance designated as meta styrol, which while resembling such materials as celluloid and "Bakelite" it differs from the former in its freedom from high combustibility and which shall differ from both celluloid and "Bakelite" in that it possesses a transparency equal approximately to that of ordinary mineral glass, being at the same time water-white and differing also from each of these substances in that it is moldable in final form, by which is meant that it may either be molded without the necessity of carrying out a chemical reaction at the same time as is necessary in the case of "Bakelite" or that it may be molded without subsequent evaporation of solvent as in the case of celluloid.

Alpha Meta Styrol

This can be made by a number of methods. For instance:

Example 1. — Substantially pure styrol derived from any of the methods in the copending application 711,584 mentioned above and capable of producing a styrol of say 92% purity or above, or styrol derived from cinnamic acid or similar material is placed in a vertical sealed tube having a diameter of approximately 0.7 cm. and a height of approximately 26 cm. volume approximately 10.0 cc.,

(*Continued on page 28*)

Casting Resinoids

(*Continued from page 11*)

may be hastened by means of salts of strong acids such as sulphates, chlorates, chlorides, and nitrates, potassium sulphate, potassium nitrate, potassium chloride, potasium chlorate, potassium iodide and potassium sulphocyanate being specifically mentioned. The product is stated to be suitable for casting.

C. Ellis, Patent 1,482,357, Jan. 29, 1924.

Invention is directed to a pure white casting made by mixing urea and formaldehyde and then adding an alkali such as caustic alkali to start the reaction. As soon as the mixture becomes turbid a mild acid such as acetic is added to check the reaction. The setting of the solution is brought about by the addition of a strong acid such as hydrochloric, sulphuric or phosphoric or an acid salt such as bisulphate or aluminum chloride. Modifying agents such as glycerine, casein, gelatin, Irish moss or algin, fillers such as Plaster of Paris, China Clay, silex, quartz, titanium oxide, flock, wood flour or asbestos or any pigment or dye may be added.

C. Ellis, Patent 1,482,358, Jan. 29, 1924.

The process is similar to that in Patent 1,482,357 with the exception that a polymerized formaldehyde such as paraform is employed instead of formaldehyde and that cotton flock, silk flock, blue dye, whiting, gypsum, barytes, Portland cement, zinc sulphide, or radium paint may be incorporated into the product.

Wm. W. Christmas, Patent 1,521,174, Dec. 30, 1924.

A composition that can be molded without the use of pressure is made by mixing comminuted wood, water and a casein glue made of powdered casein mixed with hydrated lime.

L. T. Sutherland, Patent 1,523,459, Jan. 20, 1925

An oxyaromatic alcohol such as oxybenzyl alcohol, oxymethylbenzyl alcohol, oxybetanaphtholbenzyl alcohol, trihydroxybenzyl alcohol or trihydroxycarboxylbenzyl alcohol is condensed with a cylic ether of a polyhydric alcohol such as formalglycerol, formalglycols, acetalglycol, acetalglycerol or benzalglycerol or benzalglycols in the presence of an acid or basic condensing agent such as formic acid, hydrochloric acid, phosphoric acid, sodium hydroxide, calcium hydroxide, ammonium hydroxide, sodium carbonate or ammonium carbonate. The properties of the product can be controlled by the choice of reagents and it is possible to use several ethers as well as several alcohols Dyes and pigments such as ruby red, acetal red, aurine red, ultramarine, methyl blue, methyl or chrome green, nigrosine or lamp black as well as fillers such as wood flour, cork, asbestos, cotton, metal oxides, chalk, wool, silica, etc., may be incorporated into the product.

Cheaper Raw Materials and Synthetic Methanol

(*Continued from page 12*)

the reaction is carried out around 300°C. in steel tubes under a very high pressure, such as 3000 lbs. per square inch. The compressed gases are passed through the pressure area and on escaping therefrom are condensed into methanol while still under pressure by cooling the gases. The methanol then forms a liquid, in which form it is sold.

The conversion of methanol to formaldehyde follows similar lines, for when a properly proportioned mixture of methanol vapor and oxygen or air is passed over some form of active platinum, or similar catalyst, the oxygen and the methanol will unite to form formaldehyde according to the formula first given in the present article. Formaldehyde, being a gas, and not condensible to a liquid at ordinary pressure, is caused to pass into water in which it readily dissolves. The solution forms the formaldehyde of commerce, being about 40% solution of the gas. Properly speaking this solution should be called "formalin," but usually no distinction is made by those who are using formaldehyde. By treating formaldehyde with ammonia, either as a gas or in solution, a solid compound forms, called hexamethylenetetramine, and much of the formaldehyde employed in hardening the phenolic resins is used in this form.

Quite a number of patents on the synthesis of methanol have appeared. Lately the greatest interest seems to attach to the preparation of more efficient catalysts. Four patents recently (August 21, 1928) issued to the Roessler & Hasslacher Chemical Co., (New York) on applications of Henry H. Storch U. S. P. 1,681,750; 1,681,751; 1,681,752 and 1,681,753). These describe the preparation of very efficient catalysts for the conversion of carbon monoxide and hydrogen into methanol.

Copper Catalysts

The first patent covers a copper catalysts made by dissolving copper nitrate in a slight excess of ammonium hydroxide followed by the addition of an excess of sodium hydroxide and boiling the solution until all the ammonia is expelled. This causes the precipitation of an especially suitable form of copper oxide that is washed free from salts, converted into small pills, which are then reduced in a current of hydrogen gas that has been saturated with methanol vapor, to form compacted pills of metallic copper in a particularly reactive form. These pills are used as a catalysts for the conversion of hydrogen and carbon monoxide into methanol. An alternative is the precipitation of the same copper compound upon asbestos fiber, followed by reduction to copper as already mentioned.

Fluorides As Catalysts

The second patent describes and claims copper catalyst that also include the fluorides of such metals as barium, calcium or magnesium. In order to obtain the best effects the two substances, copper hydroxide and calcium fluoride, for instance, are precipitated simultaneously by adding a mixture of potassium fluoride and potassium hydroxide to a solution of calcium and copper nitrates. The solution is boiled to form calcium fluoride and copper oxide, which are afterwards filtered off and dried, forming a black mass that is granulated to about 20 mesh and then reduced by hydrogen saturated with methanol

vapor as in the first patent. The yields with this catalyst are stated to be 54% of the mixed gases passed over the same and the product is methanol of about 98% purity.

The third patent covers a catalyst, similarly prepared, of copper and magnesium hydroxide. The hydroxides are co-precipitated, boiled, dried and the copper oxide thus formed is reduced to metallic copper in the same way as described above. The fourth patent extends the ideas already explained to catalysts consisting of palladium and chromium oxide.

The Future?

The primary interest in all these processes is the possibility that it will not be long before we can expect to have our plastics all synthesized directly from the elements themselves, and when this occurs then the **Plastic Age** will be in its noonday instead of in the graying dawn as it is today. One can already visualize the production of phenolic resins somewhat along the following lines:

1. Synthesis of methanol from carbon and water, along the lines of the above methods, as hydrogen is obtainable direct from water by electrolysis, yielding also one half the volume of oxygen which is useful in thereupon converting the methanol to formaldehyde; thus yielding formaldehyde from coal (carbon) and water.

2. The production of benzene (benzol) from limestone and carbon through the intermediate steps of calcium carbide from which, by simple reaction with water, acetylene is obtained. Acetylene gas can be polymerized to benzene, from which phenol is readily obtainable.

3. A modification in the production of carbide, by using atmospheric nitrogen, yields cyanamide, which is thus a product of limestone, carbon (coal) and atmospheric nitrogen. From this urea is prepared in enormous quantities even today.

4. Condensation of the formaldehyde with either the

(*Continued on page 34*)

Technical Abstract Section

A Concise Review of Patents and Literature

Cellulose Plastics

Alkyl Esters of Abietic Acid; cellulose nitrate colloiding agent; ethyl abieate. Alan C. Johnston, assignor to Hercules Powder Co., Wilmington, Del. U. S. P. 1,682,280; Aug. 28, 1928.

The methyl and ethyl esters of abietic acid are very thick, viscous liquids, and are very difficult to saponify, distilling in a vacuum of 10 mm. at 200-210° C. These esters exert a slow colloiding action on nitrocellulose. They are miscible in all proportions with other organic esters, benzol, acetone and butanol.

To prepare the material twenty grams of sodium hydroxide are dissolved in 25 cc. of water and then diluted with 150 cc. of ethyl alcohol. One hundred and fifty grams of wood rosin are added, and the mixture refluxed until a clear solution is obtained. Forty grams of diethyl sulphate (115% of that theoretically required) are gradually added and the alcohol distilled off. The residue is then heated to about 145° C. for from one to two hours, accompanied, probably, by agitation in order to shorten the time required for completion of the reaction, and finally the ethyl ester of abietic acid is distilled off under a vacuum. The color body of the wood rosin does not pass over in the vacuum distillation, so that a clear ester is produced. The yields obtained are about 80-85% of the weight of the rosin used.

Recovery of Camphor and Plasticizers from Pyroxylin Plastics. Harry P. Bassett, Cynthiana, Ky. U. S. P. 1,681,692; Aug. 21, 1928.

Scrap pyroxylin plastics are immersed in water containing a small percentage of acid (say nitric acid, 0.25%), and steam is passed through the mixture. Camphor and other volatile plasticizers will thereby be driven from the plastic and will pass over with the steam.

If nitric acid is employed it not only serves as an ionizing influence but it bleaches the nitro-cellulose from certain colors, such as yellow, blue, green and some reds, thereby leaving the nitro-cellulose substantially white.

Esterification of Cellulose in Presence of a Phenol. Claude Diamond, assignor to Courtaulds, Ltd., London. U. S. P. 1,681,103; Aug. 14, 1928.

Cotton cellulose and also wood-pulp which have been purified by treatment with caustic soda can be rendered more adaptable to esterification by a preliminary treatment with a relatively small proportion of a phenolic body, such for instance as phenol, meta-cresol, or a mixture of cresols.

Example 1.—To 100 parts of comminuted wood-pulp, which has been previously purified with an 18 per cent caustic soda solution and which contains 8 per cent of moisture, 15 parts of meta-cresol are added and the mixture is stirred repeatedly for from 6 to 8 hours while maintaining a temperature of 50° centigrade.

Starting with the present issue our abstracts will be classified in accordance with related subject matter.

All abstracts of patents are prepared directly from the printed copies of the specifications and aim to set forth the essential features claimed as novel. Copies of United States patents cost 10 cents and are obtainable by sending cash to the Commissioner of Patents, Washington, D. C., stating the number of the patent desired.

For reproductions of foreign articles and translations thereof correspondence with the Editorial office of PLASTICS is invited, as we are prepared to furnish this material at a reasonable cost.

Expanding and contracting Celluloid Window. Frederick H. Hall, Holford, England. U. S. P. 1,681,037; Aug. 14, 1928.

The object of the present invention is to provide an improved construction of window wherein means are provided for exerting a pull on the celluloid or the like, so that it is kept taut, whilst the expansion and contraction of the celluloid is allowed for. Buckling of the celluloid under varying weather conditions is thus prevented.

Reducing Viscosity of Cellulose Ethers. Chauncey U. Prachel and Leonard E. Branchen, assignors to Eastman Kodak Company, Rochester, N. Y. U. S. P. 1,679,943; Aug. 7, 1928.

1. The process of treating cellulose ether which comprises acting thereon with an acid until the viscosity characteristics of said cellulose ether are lowered at least one-third.

2. The process of treating cellulose ether, which comprises acting thereon with a mixture of an acid and a liquid which is chemically inert with respect to said cellulose ether until the viscosity characteristics of the cellulose ether are reduced at least one-third.

6. The process of treating cellulose ether, which comprises acting thereon with an aqueous solution of nitric acid having from 5 to 20% strength until the viscosity characteristics of the said cellulose ether are reduced at least one-third.

Resinoid Plastics

Purifying Phenolic Resins. Fritz Seebach, assignor to Bakelite Gesellschaft, of Erkner, Germany. U. S. P. 1,681,368 and 1,681,369; Aug. 21, 1928.

The first patent covers: 1. A process for making alkali soluble phenolaldehyde resins free of acids which consists in dissolving the resins in alkalies, adding to the solutions obtained so-called hydrotropic salts which have the property of rendering difficultly soluble or insoluble substances soluble in water but do not affect the solubility of the phenol resin and precipitating the resins in the presence of the said salts with acids.

The second patent claims: 1. The process for purifying fusible, soluble phenolaldehyde resins which consists in treating the fusible, soluble raw phenolaldehyde resins with not more than equal parts of water and with sufficient alkali to form a colloidal suspension and then precipitating the said resins by adding salts which have the property of salting out resins.

Condensation product from phenols, China-wood (tung) oil and aldehydes. Arthur L. Brown, assignor to Westinghouse Electric & Mfg. Co. U. S. P. 1,680,408; Aug. 14, 1928.

Four parts by weight of cresol and one part by weight of raw China wood oil are mixed and heated to 110° C. Three parts by weight of a 40% solution of formaldehyde are then added and the mixture heated to boiling in a vacuum kettle having a condenser attached thereto. The cresol-China wood oil mixture, while at 110° C. is emptied, by means of a pipe connection with vacuum kettle, into said ket-

tle while the formaldehyde solution is boiling and the reaction is allowed to proceed at 93 to 98° C. for 80 minutes. The condenser is then disconnected, vacuum is applied (about a 25 to 26" vacuum) for about 2 to 2½ hours, or until substantially all the water has been eliminated and the product is at 97-98° C. The material is then removed from the vacuum kettle, and is placed in a suitable open kettle, and is held at about 100° C. for about 10 hours or until it is unsafe to maintain this heat longer on account of the proximity of the insoluble stage of the product.

The final product may be dissolved in suitable solvents, preferably with the aid of heat to hasten solution thereof. The material is soluble in coal tar solvents, such as benzol, toluol, heavy naptha and the like. It is also soluble in turpentine, mixtures of benzol and olcohol, and mixtures of heavy naphtha and kerosene. The material may, in the dissolved state, be used for impregnating fibrous material, such as paper, for molding purposes or it may be used as an air-drying varnish or as a baking enamel.

Mechanical

Chromium coated dies for molding albumen plastics. Felix Homberg, assignor to American Nuplax Corp., N. Y. City. U. S. P. 1,678,117; July 24, 1928.

The method of molding albumen containing bodies which comprises providing a metallic mold coated with chromium, and molding said body in said mold.

Molding Compositions

Quick-molding (cold) composition. Oscar A. Cherry and Cletus F. Chosa, assignors to The Cutler-Hammer Mfg. Co., Milwaukee, Wis. U. S. P. 1,678,635; July 31, 1928.

To a cold-molding composition comprising coaltar pitch, stearine pitch, gilsonite and castor oil, plus the usual inorganic fillers and sulphur to act as a vulcanizing agent, a small amount of cresol and sulphur chloride is added. A typical claim is: 5. A molding material adapted to a quick forming treatment under pressure followed by prolonged heat treatment, comprising a binder and a relatively inert filler incorporated therein and impregnated thereby, said material having also incorporated therein relatively small quantities each of a halogen derivative of sulphur and a phenolic body adapted to react therewith for formation of additional binder material in situ.

Cold Molding Resins
A Review by C. W. Rivise
starts in February.

More About Styrol Resin Production

(*Continued from page 23*)

the height of styrol in the tube being approximately 4.5 cm. and occupying roughly one-sixth of the volume of the tube. The lower portion of the tube, the tube being in approximately vertical position, is held in an air bath heated to approximately 140° C. for 20 hours at the end of which time polymerization is substantially complete and tough, transparent polymerized styrol or alpha meta styrol is obtained, the product being substantially free from unpolymerized styrol.

Alpha Meta Styrol

Alpha meta styrol is a substance which is tough and permanently transparent and may be practically colorless. It shows a dull fracture and may be cut with a knife to form thin films or parings. It has a high refractive index, namely 1.5 to 1.75. Its specific gravity is but very slightly greater than that of water, the unfilled clear material having a sp-gr. of 1.05. Its hardness on the mineral scale is 2-3; its piercing potential for electricity is above 850 volts per mil.

The product is substantially stable under the action of sunlight and weathering. It withstands relatively strong blows with a hammer. It is ground with great difficulty to a powder. As the completely polymerized mass cools the fresh product almost invariably breaks the glass vessel in which it is polymerized as it detaches itself from the sides of the vessels. It retains its shape substantially unaltered at approximately 100° C. It has a transverse tensile strength of 6000-7000 lbs. per square inch. In solution it does not decolorize a 3% solution of bromine at 0° C. It shows substantially no change under the prolonged action of hydrofluoric acid. On dry distillation at 375-475° C. it produces as high as 70% of its weight in styrol.

The homologs of styrol, such as the ethyl and dimethyl styrols yield similar products.

For instance alpha meta 2-4 dimethyl styrol retains its original form without appreciable change even when the temperature is changed to dark red heat. At normal pressure this substance does not melt. Upon dry distillation it gives off dimethyl styrol and tetramethyl distyrol. The surfaces of the homologues of alpha meta styrol displayed a wonderful lustre and have a highly polished appearance. When kept in storage for any length of time they do not lose their transparency and the lustre of the surface remains unchanged. The various alpha modifications have a relatively large coefficient of light dispersion.

Homologs

Like alpha meta styrol the various substances designated as alpha meta $ArCH:CH_2$ have a surface which appears polished and displays a wonderful lustre. When kept in storage for any length of time they do not lose their transparency. They have a relatively large coefficient of light dispersion.

The soluble alpha modifications of polymerized homologues of styrol display the physical properties and constants of alpha meta styrol. Like this substance they easily dissolve in benzol and other aromatic hydrocarbons, in pyridine, chloroform, carbon disulphide, ether and carbon tetrachloride. They dissolve with difficulty with turpentine and are entirely insoluble in water, alcohol, acetone, paraffine oil and petroleum oil.

Alpha More Useful

The alpha modifications of $ArCH:CH_2$ and alpha meta styrol as plastics are apparently more useful materials than the beta, gamma, and complex modifications. They lend themselves readily to molding and possess the advantages over plastics, celluloid and "Bakelite" recited among the objects of the invention as detailed above. Alpha meta styrol is a particularly useful substance being made from relatively inexpensive materials readily obtainable on the market. While it is as water white as glass and as transparent, it is not so brittle and therefore resists cracking to a greater extent. If cracking does occur the edges are not so sharp and hence not so apt to cut as in the case of glass thus making this material valuable where a material having such characteristics is needed.

Beta Meta Styrol

U. S. P. 1,683,403; Sept. 4, 1928, describes the preparation of beta meta styrol.

Beta meta styrol may be formed from styrol of approximately 92% purity and the homologues of beta meta styrol may be formed from $ArCH:CH_2$ wher Ar is aryl. By exposing styrol in a suitable quantity to the action of heat for a sufficient length of time beta meta styrol is formed. The temperature and time required to produce beta meta styrol is in general in excess of that required to produce the alpha modification.

Polymerizing

A specific example of the production of beta meta styrol is as follows: Styrol of upward of 92% purity is heated in a sealed glass tube half filled with the material and placed in a horizontal position, the heating being continued for 40 hours in an air bath heated to 140° C. approximately, at the end of which time polymerization is substantially complete with the production of beta meta styrol. The tube may be 0.7 by 26 cm., having a volume of approximately 10.0 cc. in which case the amount of styrol which may be satisfactorily employed is about 5.0 cc.

Beta meta styrol is a transparent substance which may be substantially colorless. The transparency is usually lost on standing, at first in spots and finally the mass becomes dull and slightly translucent. The fracture of beta meta styrol is shiny and lustrous. It is not susceptible to cutting, sawing, planing, and polishing operations, cracking badly when subjected to these operations. When cut with a knife it splits into small grains, the surface of the cut being shiny and pitted. When hit with a hammer a relatively weak blow, or when dropped from a relatively inconsiderable height it cracks. It can be readily ground to a powder in a porcelain mortar. On cooling after complete polymerization it detaches itself from the sides of the glass vessel in which it was polymerized without breaking it. Heated to 100° C. it becomes appreciably more plastic and gradually loses its shape. The transverse tensile strength is 1000 lbs. per square inch. Upon dry distillation it produces approximately the same results as alpha meta styrol that is it produces as high as 70° of its weight in styrol when heated at 375—475° C. When treated with bromine in the manner indicated for alpha meta styrol practically the same result is effected as with the alpha modification in that when in solution it does not decolorize a 3% solution of bromine at 0° C. Its reaction with prolonged treatment of hydrofluoric acid is the same as for alpha modification both materials being substantially unchanged. The beta modification of meta styrol as prepared in the above manner is substantially free from unpolymerized styrol.

Gamma Meta Styrol

The next patent, U. S. P. 1,683,404; Sept. 4, 1928, discloses the method of preparation and the properties of the gamma meta styrol.

Generally speaking, the gamma modification results from the polymerization of $ArCH:CH_2$ compounds in the presence of

peroxides, especially organic peroxides.

Example I.—As a specific example, 1 gram of benzoyl peroxide is dissolved in 100 grams of styrol, and the solution is heated for 1-1½ hours at 175°-180° C. The styrol is completely polymerized to form a transparent solid.

Example II. — The benzoyl peroxide may be replaced in Example I by 2 grams of triphenylmethyl peroxide. When the styrol solution is heated as in Example I, it polymerizes to a solid mass. If desired, benzoyl peroxide and triphenyl methyl peroxide may be used simultaneously.

Gamma meta styrol is a transparent, brittle substance which in thick layers has a yellowish color which displays a high coefficient of light dispersion. It does not become cloudy when kept for some time. Its fracture is shiny and lustrous. It may not be readily cut, sawed, planed or polished. When cut with a knife it splits quite readily into small grains. The surface of the cut is shiny and pitted. When struck with a hammer gamma meta styrol cracks quite easily. It can be ground to a powder in a porcelain mortar with great ease. Upon cooling after complete polymerization it detaches itself from the sides of the glass vessel in which it was polymerized without breaking it, but gives deep cracks inside the mass often splitting into several pieces. Upon being subjected to 100° C. it becomes increasingly more plastic and gradually loses its shape. It has a transverse tensile strength of 1,000 lbs. per sq. inch. In solution it does not decolorize at 3% solution of bromine at 0° C. The substance is substantially free from unpolymerized styrol.

Sources of Styrol

Finally we come to the description of a method for the preparation of some of the styrol and the methods of polymerizing it to remove it from the mixture of crude products re-

sulting from the cracking of crude oils.

In Ostromislensky's application No. 6,003, filed January 31, 1925, it was stated that certain by products of the carbureted water gas industry contain $ArCH{:}CH_2$-yielding hydrocarbons. It has also been found that another source of $Ar.CH{:}CH_2$ is obtained by cracking petroleum oils directly. These oils may be cracked under widely varying conditions for the purpose of producing $ArCH{:}CH_2$-containing fractions.

As an example of such procedure 8000 grams of Oklahoma petroleum are passed through a hot tube at a temperature of 650° C. and at a rate of 20 grams per minute. Simultaneously a stream of some inert gas, such as nitrogen or carbon dioxide is passed through the tube at the rate of say 50-60 ccs. per minute. This cracking operation yields 4400 grams of gas and 3200 grams of liquid condensate. This condensate is found to contain about 500 grams of styrol amounting to 6.25% based on the amount of oil originally cracked. The condensate is distilled with steam and a distilate amounting to 1920 grams is obtained. This is then subjected to a polymerizing action by heat at 200-220° C. for approximately 16 hours to produce the resinous polymerized styrol. This is then distilled to free it from other hydrocarbons and depclymerized by dry distilling at 350-500° C. to form a mixture containing styrol and distyrol together with small amounts of other hydrocarbons. Steam distillation of this mixture frees the styrol from the distyrol and other high boiling substances which may be present. The resultant styrol is then polymerized to the vitreous modification according to processes already fully described herein.

In patent 1,683,401 Morris G. Shepard is the joint inventor with Iwan Ostromislensky. There appears to be no doubt but that these compositions are destined to play an important part in the plastics industries of the future.

Mottled Pearl Plastic Sheets

(*Continued from page 19*)

semblance to true mother of pearl. While almost perfect orientation has been accomplished, proper sheen, contour and mottling have not yet been attained.

Re-sheeting

The cast film or sheeting, still containing 12 to 20% of liquid solvents, acetone and alcohol), is now cut into suitable size sheets for making a stack 3 of sheets for a cake press, the sheets are wiped with some suitable solvent, such as ethyl acetate, and stacked sheet on sheet in the press, as indicated in Figure 3 wherein the various sheets are designated as 1^a. In the press the stack is subjected to sufficient heat and pressure to weld the sheets into a single block 4, the welding entailing no particular difficulties, and the usual practice of the art being satisfactory. The resulting homogeneous and unitary block is then sheeted horizontally into sheets 4^a, 4^d between, say, .040 and .125 inch thick, preferably .06 inch, as indicated in Figure 4. Figure 5 shows conventionally one of the resulting sheets, it being there indicated that the original primary orientation of the crystals, with the crystals 2 lying substantially horizontal and facing all in substantially the same direction, has been substantially preserved. Some of these sheets, as sheets 4^d, sufficient for the operation next described are cut up into small pieces D, preferably of regular-polygon contour, say diamond-shape, as indicated in Figure 6. The pieces may be of any desirable size, and I have found desirable diamonds about $2x2\frac{1}{2}$ inches, giving approximately 25 pieces per square foot in the layer mentioned below.

Another stack 5 (Figure 7) is now made up preparatory to another blocking operation, the purpose of which is to give the changeable effect that is characteristic of true mother of pearl. Pearl essence particles show all their lustre in one plane, that is, they are lustrous on their broad surfaces, but they are without lustre on a plane at right angles to this one plane, that is, they are dull upon their edges. The sheets 4^a, etc., since they have substantially all their particles lying flat and horizontal in the sheet, have a sheen which, although high, is not so changeable as I desire.

In making up the new stack (Figure 7) alternate layers of full sheets, as sheets 4^a, and polygonal pieces D are laid up, the stack desirably beginning at the bottom with a layer of pieces D. In laying up the pieces D, a sufficient number may be used in a layer to give an amount of material substantially equal to a full-sheet layer, but as indicated in Figures 7 and 8, this condition need not be strictly adhered to. It is desirable that a layer be of such thickness that, as indicated in Figure 7, there are substantially merely enough pieces in a layer to approximately cover the full-sheet layer beneath. (It will be understood that, actually, the pieces may not necessarily lie in straight layers, as shown in Figure 7, but that certain of them may be tipped due to members of an upper sub-layer of pieces partially falling into spaces between pieces of the lower sub-layer, as will be evident from a consideration of Figure 8 and from the fact that, as before stated, the pieces are merely promiscuously laid in.) When placing the pieces they are desirably spaced a small distance apart at their edges as indicated at 6 in Figures 7 and 8. Also the pieces are turned so that the pearl essence crystals of the various pieces face in different directions. It will be understood that this latter condition is provided for by merely laying in the pieces promiscuously,

it, of course, not being feasible to actually determine the direction in which the crystals lie in particular pieces. The stack is now welded as before into a block 7 (Figure 9) and sheeted into sheets 8 (Figure 9), giving the product (Figure 10). The finished sheets have not only the mottled changeable effect desired but also bear the outlines of the irregular-shaped pieces. When, as generally occurs, the pieces of one layer are not in register with the pieces of another, the result is particularly pleasing; the effect of one layer of diamond-shaped pieces is noticeably carried through several layers and blends with the effects of others, and gives a "watered" appearance.

In the above welding operation under heat and pressure, the material of course flows somewhat. In this flowing or shifting, the pieces D, while coalescing and joining, depart somewhat from the simple horizontal position in which they were originally placed, which results in certain of the pearl essence crystals having a position in the block which departs somewhat from the horizontal, so that as the final sheet 8 (Figure 9) is viewed from above—the normal position from which it is viewed in use—some of the crystals will be seen other than flatwise. (Possible positions of some of these angularly placed crystals are indicated at 2^A in Figure 8, and some of the normally placed ones at 2^N.) This tipping of some of the crystals gives the changeable effect desired. Furthermore, since even those crystals which lie in the same plane extend in different directions, as indicated in Figure 10, an additional desirable effect is obtained in this way.

Referring to Figure 11, as another method of promoting shifting of the crystals, I, instead of using all flat sheets of cast film in making up the stack 3, Figure 3, may use crinkled

Cellulose Chemistry Becoming Increasingly Important

THE first real plastic material, in the modern sense, was pyroxylin, in the form of Celluloid, Zylonite and the like. For many years the only regular molding compositions were based on either resins like shellac or bitumens and pitch. Not until the twentieth century did cellulose acetate become of any commercial importance and it is really only since the war that it has become available at a price making competition possible.

In the recent past many new plastics based on cellulose have been developed. As the understanding of the nature and constitution of the cellulose molecule grows, much progress may be expected, especially along the line of products having definite and predictable properties.

As there exists at present, in America, no medium that discusses in detail the chemical and technological development of the production of cellulose, aside from the paper manufacturing industries, *Plastics* now proposes, in the near future, to act as a clearing house for information in this field, that is so closely related to plastics themselves.

Our aim will be to bring abstracts of foreign articles, in sufficient detail, to enable the understanding of the scope of the abstracted article without recourse to the original. We have had many requests to widen the horizon of our field, and we trust that this expansion will meet with the response we expectantly look forward to.

In this connection we hope that we may have the full cooperation of all those—and there are thousands of them—who are interested in the development of improved processes for the production of cellulose for nitration, acetylation, conversion into cellulose ethers, viscose, vulcanized fiber, etc. As our forests become depleted, new sources of cellulose must be found. The recent development in the production of high grade cellulose pulp from corn stalks and from cotton seed hulls and rice hulls is an example of the trend of the times.

The enormous increase in the use of cellulose ester lacquers and the enhanced interest in suitable solvents also necessarily will lead us into the field of lacquers and solvents, for, after all, there is but little chemical difference between a photographic film in a camera and a pyroxylin film on the latest motor car.

The projected expansion of our periodical will naturally result in increased circulation and will extend it into fields where it has not penetrated before. This will also provide a medium of excellent advertising equipment, materials and supplies for this already vast but still rapidly growing industry.

Growing Interest In Solvents

Just before the war, only a few solvents had been made commercially available, but now many formerly rare solvents are being shipped in tank cars. Examples of this are butanol (butyl alcohol), propanol (propyl alcohol), Petrohol (iso-propyl alcohol), butyl acetate, propyl acetate, cheaper acetone, synthetic methanol and a host of plasticizers and softeners.

Almost every day we hear of new projects and many concerns are being organized to enter the field of cellulose plastics and lacquers. Every one of these is a prospective purchaser of solvents, plasticizers, equipment and supplies. If you have anything to sell to these concerns, there is a good reason for you to use our pages to acquaint them with the merits and desirability of your goods.

We welcome, and invite, the reactions that this article produces in our present readers. Tell us what you think of it. Brickbats as well as bouquets will receive equal attention.

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sheets 9. These sheets are preferably made from plastic masses which have had a suitable quantity of pearl essence mixed into them on the rolls, the sheets 9 being portions of thin sheets from the rolls and which have been crinkled, as by manipulating by hand or passing through crimping gears, as will be understood by those familiar with the usual ways of making up crude plastic sheets. Or, if desired the crinkled sheets may be cast film sheets which have been crinkled by passing through embossing rollers or crimping gears. In making the stack it is preferable to interlay crinkled and flat sheets, alternating, with all containing pearl essence, but it will be obvious that all crinkled sheets could be used, and also that all sheets need not contain essence. Certain of the sheets sliced from a block 4 made from the stack shown in Figure 11 are desirably cut into diamond-shaped pieces for making up the block 5, as above described; but if desired this cutting into diamond-shaped pieces may be dispensed with for the crinkly sheets themselves promote, to a considerable extent, the flowing, etc., promoted by the separate diamond-shaped pieces.

Synthetic Methanol

(*Continued from page 25*)

phenol of paragraph 2 or the urea of paragraph 3 yields two of our most common plastics today—the phenoplastics, and the aminoplastics. In other words, resinoids from coal and water.

It should be obvious even to our lay readers that a proper understanding of chemistry is an essential if one is to follow the progress being realized in plastics, and to envision the possibilities of the future.

MOLDED PRODUCTS

Devoted to the purchase, further use and merchandising of all manner of molded parts

Vol. 3 JANUARY, 1929 No. 1

Some Highlights of the European Molding Industry

Important developments in Great Britain and the Continent

By A. C. Blackall

British Correspondent of Molded Products

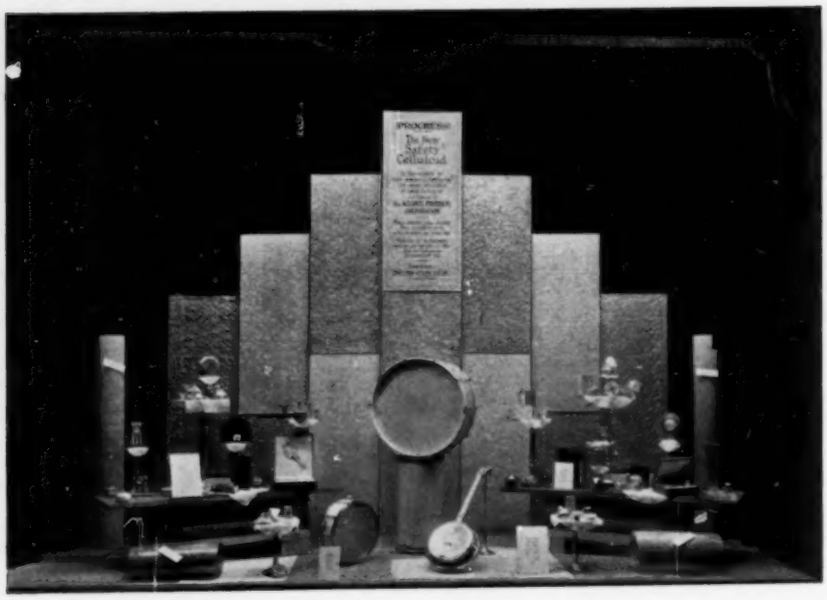
Synthetic resins are becoming very popular in Britain. A large number of articles formerly made of other materials are now molded of beatl, bakelite or other resinoids. There is also a marked increase in the manufacture of British cellulose acetate products.

Italy has shown considerable activity in the manufacture and use of synthetic resin and casein plastics.

The present article gives an interesting general survey of these developments.

AT the annual meeting of The British Cyanides Co., Ltd., which was recently held in London, the chairman (C. F. Rowsell) delivered an address reviewing the progress made by the firm's subsidiary undertakings (Beetle Products Co., Ltd., Beatl Sales, Ltd., and the Streetly Manufacturing Co., Ltd.) in the exploitation of thiourea resins. Products produced by these concerns from thiourea resins are known as "beatl" ware. This material is non-fragile and non-inflammable, it does not warp and is not affected by hot water. Being tasteless, it imparts no flavor or odor to food. It is not sold as unbreakable, but it is not fragile as are china, glass and earthenware. Moreover, it does not readily chip. It will withstand moderate degrees of heat, but must not be baked in a hot oven or placed upon a hot-plate, as excessive heat will spoil it. It can be washed in hot soap and water, but soda should not be used. All surface stains can be removed by rubbing with moistened salt. The new nursery lines in beatl ware fill a long-felt want, the mugs, tumblers, plates, etc., giving good service and the attractive colors available delighting the children. As playthings the small cups and saucers and other articles are novel and safe. A junior set consisting of small cups and saucers, four small plates, a cream jug and sugar basin, all fitted in an attractive black and gold box has been brought out as a children's Christmas line which can also be used as a black coffee set "for mother." This set for four retails at 21/6 (about $5.35).

In his address Mr. Rowsell stated that his company now holds the entire capital of the Streetly Manufacturing Co., Ltd., as a result of an opportunity that arose following the death of one of the proprietors of the business. It is an important molding company with much experience behind it, and it will enable the British Cyanides Co., Ltd.. to ensure that the moldings from its black and dark-colored powders will have the chance of establishing their merits in competition with molding powders already on the market and that it shall be able to compare its performance in molding under commercial conditions with all other molding powders. Another object in securing control of this firm was to permit of new lines of development for Beetle powders. In such development work some measure of risk is inevitable, and the manufacturer of the powder is in a position to take risks which a molder, as such, cannot afford to take. It is hoped in this way to open up new markets which will be followed by the molding industry.



A display of cellulose acetate products in the window of a London department store.

An important addition has been made on the technical side of this undertaking. Kenneth Chance, the managing director, was desirous that in addition to the able assistance of Dr. Rossiter, the technical director, other technical assistance should be secured to enable prompt and efficient action to be taken in new developments. He accordingly arranged for R. G. Perry and Samuel Whyte to join the board. Both these men are noted technologists.

Mr. Chance followed Mr. Rowsell with an address in which he emphasized the importance of being able to manufacture thiocarbamide cheaply. It is becoming more and more clear that thiocarbamide is an essential ingredient in the manufacture, at all events, of light-colored molding powders and almost certainly of colorless resins. The company therefore aims to attain a position in which it will command supplies at a price which will defy competition. So far it has succeeded in doing this, but with the increasing requirements for molding powders and resins in Britain and the developments that are taking place all over Europe, it requires increased supplies of raw material. A contract has, therefore, been concluded with the Birmingham Corporation which will permit of the company drawing largely increased supplies of sulphocyanide from it in the early part of 1929 from plant erected by the corporation at the company's expense. For this purpose £20,000 ($100,000) has been expended in plant for two of the gasworks, and this outlay should provide substantial profits when it becomes productive, besides securing to the company supplies of raw material. Completion of the new plant is guaranteed by February.

Beatl Lamps

In tableware the company is trying to confine production of moldings to two trade marks—bandalasta and beatl. The company's chief customers—Brooke & Adams, Ltd., manufacturers of bandalasta ware—are constantly thinking out new designs, one of the latest being a new table lamp of exclusive design. The lamp has graceful lines and sheds a soft glow which is not trying to the eyes. The shade is made of the same material as the body of the lamp, and does not harbor dust like silk. The smooth flowing lines of the whole lamp render a wipe over with a duster all that is necessary to keep it in spotless condition. It is supplied in five stock colors: brown marble, rose marble, marbled orange, marbled green, banda rouge. As the shade will fit a standard lamp holder, it can be supplied separately for use as an ordinary shade.

The advantages of beatl for the cosmetic trade are now becoming recognized and the firm of Morny Fréres has chosen a tortoise-shell color for its shaving soap basins and shaving stick holders. This is made from the cheaper dark shades of Beatl and compares well in beauty with other dark-colored moldings. It is fair to assume that other perfumery firms will follow this example, and wherever possible it is the intention of the molders to reserve to each firm the color mixture it may choose for its containers, always provided that the business is sufficiently large. For example, Rolls Razor, Ltd., has chosen a mottled blue variety for its shaving soap containers. These containers are designed very similarly to those of Morny Fréres, the chief distinction being in the color.

Plastic Tiles

The company has also spent much time on the design of a tile for bathrooms, hospitals, etc., which will economize in prime cost and will do away with the messy and expensive process of plastering. The firm has evolved a simple method of application of these tiles by means of solid grooved brass slides. This makes their laying and removal equally easy. The tiles are in a wide range of pleasing colors, are vermin-proof, non-inflammable and practically indestructible. For the past nine months some of them have been put to a severe test in an atmosphere of steam and exposed to draughts, from which they have emerged with complete success. Two or three grades may be put on the market, but the best quality as now produced will probably prove the most popular. It is inexpensive and virtually unbreakable owing to the fact that it is made of cardboard covered with beatlware. These tiles have not yet reached the productive stage, but the company has succeeded in its objective after many months of experiment.

Another interesting use for moldings from these powders

is being developed by Roanoid, Ltd., in ships' fittings, i. e., for cabin fittings and fixtures in passenger ships. Seeing the possibilities in this direction opened up by molding powders, this firm attacked the problem and has met with great success. As a result it reports that the great majority of passenger vessels now being built in Britain will have their cabins equipped with fittings made from Beatl powders. With the production of Beatl tiles and Roanoid fittings, it would appear that the problem of how to fit up a bathroom or cabin with uniform materials should soon be solved.

Experiments in the production of phonograph records from beatl ware are also in progress, the firm working in collaboration with one of the leading phonograph companies. These experiments, however, have not yet reached finality.

British Safety Glass Development

Another article on which progress has been made during the year is splinterless glass. The manufacture of safety glass with a sheet of celluloid cemented in between two sheets of glass is a process the patents of which have now expired, and which is, therefore, open to the entire industry in Britain. The celluloid sheet, however, has the disadvantage that it discolors after a time; while for cellulose sheet, which is made from cellulose acetate instead of cellulose nitrate and does not discolor, no suitable transparent cement has yet been found. Research on this problem has been proceeding throughout the year and a product has been evolved consisting of cellulose acetate sheet between two pieces of glass. This has a slight opalescence, but it is thought that this will disappear when the gum is made on the works scale instead of in the laboratory. The cement is very strong. In this, as in other industries, the company's policy will be to supply the raw material to the trade, provided that satisfactory arrangements can be made.

The company's research department is also searching for a glaze for beatl ware. Beatl requires more washing than china, and, if it gets dirty, as both china and beatl ware do, the china is cheap, breaks easily, and is thrown away, whereas the merit of beatl is that it lasts. Therefore, in order to get beatl ware taken up by the big restaurant chains, railways, etc., it is essential to get a glaze which will enable it to be washed with even greater ease than china, because it is the durable qualities of this ware that make its use economical. The opening for such a glaze is enormous. The firm's chemists are constantly working on the problem, while their German associates are attacking it from another angle. The glaze needed must be able to withstand boiling water, be absolutely transparent, colorless, tasteless and odorless. It must also be very hard, easily applied, and must become homogeneous with beatl ware. The German firm referred to is the Rheinisch Westfalische Sprengstoff Actien-Gesellschaft, of Troisdorf, near Cologne, with whom an arrangement has been concluded whereby it will put up plant for the manufacture of beatl powders in Germany as sole concessionaires, on terms giving the British Cyanides Co., Ltd., an interest in profits equal to theirs, the British firm to supply the German firm with thiocarbamide. This German firm is closely associated with the German chemical trust (I. G. Farbenindustrie Aktiengesellschaft).

Bakelite

A firm of the greatest importance which has been very active during the year is Bakelite, Ltd., and Bakelite lighting accessories are being used in continuously increasing quantities throughout Europe and in many cases have apparently superseded metal. Electric lighting signalling systems have made good use of this material and in power station equipment it has proved very useful. Telephone manufacturers are also using increasing quantities of it in place of hard rubber. At the recent Radio Exposition in London Bakelite was to be seen on almost every exhibit and a striking note was set by the many improved designs made possible by the use of the product.

Airplane Manufacturers Use Phenol Resin Parts

Due to its low specific gravity and its ability to withstand changes of temperature British airplane manufacturers are using Bakelite parts in many of their newest designs. Automobile manufacturers were among the first users of the material in Britain and it was interesting to note the many new parts of Bakelite featured on the 1929 models at the recent Automobile Show in London. The growing artificial silk industry also employs Bakelite molded parts in wide variety owing to its acid-resisting properties.

At the firm's London headquarters the writer was shown an array of new lines intended for Christmas trade, which included candlesticks, clock cases,

Two molded candle sticks in mottled color effects.

buttons, pipe-stems, knife-handles, cigarette cabinets, ash trays, loud speakers, fishing reels, door knobs, desk lamps, and puff bowls. The new range of colors recently introduced has proved very useful in the manufacture of novelties and fancy goods, as well as some very attractive articles in the way of salad bowls, tea-trays with extremely natural wood graining, etc.

At its works at Birmingham and Darnley Dale, the company is now producing four grades of Bakelite sheet: (1) a general purpose insulating sheet in black and brown, which machines readily and does not split or warp; (2) A sheet for punching, shearing, etc., which does not chip or crack, and is an ideal material for producing discs, washers, etc. Made in brown; (3) A specially produced sheet for telephone insulation, of high volume and surface resistivity, and suitable for punching. Made in brown; and (4) A canvas impregnated brown sheet for production of gears and pinions. It is silent in operation and no shrouds or end plates are necessary.

An interesting acid-resisting hard rubber pump has recently been introduced on the English market by the American Hard Rubber Co. (Britain), Ltd. This new pump is proving popular among chemical manufacturers. It is a rotary gear pump designed for a great variety of uses in the handling of corrosives, including acids, alkalis, and their solutions. Every part of the pump mechanism which comes in contact with the solution handled is made of hard rubber specially selected for its inertness to chemical action. There are only 22 parts to the pump, all of which are interchangeable. Two hard rubber gears in mesh work in conjunction with each other on the inside of a close-fitting casing. As these gears rotate, they carry the liquid in the space between the gear and housing until it reaches the outlet. Here the gears mesh again, driving the liquid through the outlet pipe. The gear teeth are in continuous contact and are operating at a uniform velocity; therefore the discharge is continuous and not pulsating. Each tube acts like the piston of a double-acting pump, except that there is no change in velocity due to changing the direction of the piston. It is continuous and in one direction. Another important division of this firm's manufacturing is the production of hard rubber lined steel chemical tanks of many sizes and also solid hard rubber tanks and baths for the same purposes.

Italian Caseins, and Synthetic Resins

Italy has been active in the production of casein and synthetic resin plastics during the year. Proteolite, Zoolite, and Galakerlite—all casein plastics—are now manufactured at Milan in three up-to-date factories, and are marketed in the form of sheets, rods, and tubes. No figures are available for this year's production, but in 1926 the output was 3,700 quintals. The total annual productive capacity is now 6,500 quintals.

Synthetic resins are reprented in Italy by Bakelite, and Resin Super Bo and Super Ba, which are obtained by condensation of phenol and formaldehyde. In 1926 the total production was 3,200 quintals. The industry is carried on in Italy in three works located at Milan, Turin, and Ferrania (Savona). The development of synthetic resin production has led to the establishment of various other industries which use these resins as raw materials either for making tubes and plates of "bakelized" paper and fabric, or for the production of pressed goods for electrical and chemical purposes, or again in the preparation of varnishes for electrical insulation work and chemical processes.

Something New Under The Sun

THE gentle art, or science, of smoking being already an ancient and honorable pastime, innumerable varieties of ash receivers have been designed to accept the residue of smoking progress. It might seem, therefore, that there were little room for further invention along this line. The gamut of ash tray design has been very broad, in fact ash trays have been designed to be obviously what they are and again to resemble every

By courtesy of Bakelite Corp.

other conceivable object, from open mouthed Chinese mandarins to Swiss cottages. The object has always been to receive the ashes, although the cavity presented for this purpose has varied from capacious urns to wee shallow dishes, the latter of very slight utility. In many of these the "butt" and ash contents remain permanently in view of the audience, while in others novel trap doors and similar arrangement are devised so that nothing but an innocently ornamented surface appears.

There is, however, seemingly something new under the sun in the way of ash trays, and for this the Belroth Company, of Chicago, Illinois, are responsible. To begin with, their novelty has the advantage of capacity. In the second place, it is attractive in appearance, and thirdly, we might remark that it is most convenient and adaptable in design. The device consists of an ample ash receiver cup, which is attached, but easily removable, on a spring-equipped spindle and clamp arrangement which permits of its being fastened to the edge of the bridge table, to the arm of the rocking chair, or we suppose to the cross bar of a crutch, if one felt the need of such equipment when travelling about.

The Belroth ash tray is set in place in a jiffy and the ash receiver cup is pleasingly deep so that the smoldering remains are quite well out of sight. It is further possible to swing the cup completely under the table. The top of the bracket is designed to serve as a cigarette or cigar rest if desired. Bakelite molding material is used for the construction, and there is provided the usual smooth lustrous surface finish, strength, and endurance, coupled with the attractive effects secured by colors of Chinese red, jade green, and mottled mahogany. Generally considered, from the standpoint of novelty and utility, we know of few gifts in the smokers' accessory line which are so commendable as the device which we have been discussing.

Manufacturers May Cooperate on Color Cycles

The ever growing variation in color in molded articles is raising an important industrial problem.

Written expressly for Molded Products

By Waldon Fawcett

THE feast of color in which industry has recently indulged is having the inevitable reaction. Business is threatened with color colic. Uncle Sam has been hurriedly summoned as consulting doctor. His diagnosis indicates the need for a much more rigid color diet. But there remains the problem of persuading the patient to accept this remedy for the present indigestion, and the worse attack that is in prospect for the near future.

For the sudden alarm over color ache, the consumers of colorful staples and specialties are in no degree responsible. The purchasing public is as keen as ever for color and greets each new tint or shade with fresh enthusiasm, no matter how rapid the succession. It is the manufacturers, or a certain proportion of the manufacturers, who are worried by color multiplication and have turned to the U. S. Department of Commerce for relief, direct or indirect.

Colors Increase Competition

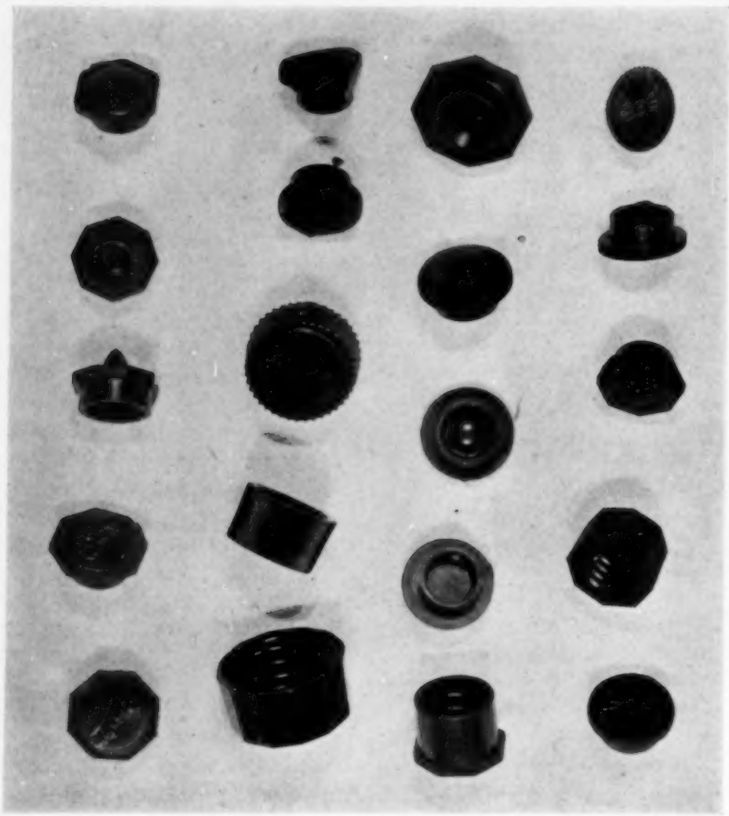
Manufacturers have been spurred to action by the unrest of a minority of distributors who are plainly worried over the lengths to which competition is carrying the use of colors on kitchenware and other classes of molded products. It is not that the far-sighted operators in the fields of production and distribution are fearful that the public will be "fed up" by a surfeit of color. Specialists, who have made a study of the craze for color, are almost unanimous in the belief that color will rule, for many years to come, as the main element in the styling of merchandise. Even the conservatives are ready to take that assurance at face value. Their color worries are solely on the side of capital investment.

The color reformers feel that over-diversification of color is likely to prove as serious an economic crime as any other form of over-diversification in industry. Indeed, they say that it is inconsistent that industry, in countless lines, should busy itself with simplification,—the weeding out of odd sizes, superfluous patterns, etc.—and at the same time allow the changes to be rung indiscriminately on color when over-diversification of color carries the same penalties: Inflated inventories, frozen credits, stagnation or congestion in distributive channels and undue strain on stock room and warehouse space.

Color Rotation

Kitchenware manufacturers, and others similarly involved, have put forward as a cure for this condition a prospective system of ordered or controlled color cycles to be known as "color rotation." Not only the details but the main formula remains to be worked out. That is one reason why the officials of the U. S. Division of Simplified Practice have been appealed to. In addition to the desire to enlist a neutral and impartial go-between that can induce competitors to make common cause. Frank cooperation is essential because the color rationing will be voluntary.

With all the talk, these days, of standardization of manufactured products by mutual consent, it was natural that, in the new-found color crisis, thought should turn first to Simplification



By courtesy of General Plastics Inc.
These screw caps molded of phenol resin appear in a variety of colors.

in whatever form would prove appropriate. As luck had it, however, the color-using industries are urged by a special incentive to invoke this stabilizer. The whole history of fashion in all the lines traditionally susceptible to color shows that, in so far as popular taste is concerned, colors move in cycles. One group of colors having enjoyed favor for a given length of time is inevitably and automatically succeeded by another set of shades. In the textile and apparel industries, experts insist that they can predict with reasonable accuracy, what complimentary or contrasting colors will become the mode when a passing color style has lost its vogue.

Given the time-honored color cycle as a ready-to-hand vehicle of color control, the disciples of joint regulation hold that it only remains to set up in industry the permanent or continuing machinery necessary for color selection, determination of duration of color tenure, and the other arrangements for a revolving schedule. It has been suggested that the scheme of color succession might be left, in each industry, to a committee such as has functioned successfully, in many an instance, in working out other forms of simplification. As in the parallel programs sponsored by the Department of Commerce, acceptance of color nominations by, say, 85 per cent of the producing capacity of an industry, would result in proclamation of the accepted hues as the "approved" or "official" colors for the year or season.

No Restriction In Colors

To correct, forthwith, a creeping misapprehension it may be stated that it is not in the minds of any of the color rotarians to restrict the color range say, by an attempt to confine the current color resources to a small group of colors or to a variety of tints or shades of a featured color. Such concentration may be very well in the dress industries. But the industries that give color to molded products are not to be so cramped. It is assumed that each successive color card would carry one example of each of the primary colors,—red, blue, yellow, etc. All that would be attempted in cooperation would be to line up all producers for a given shade of blue and a selected tone of red for the period, thereby avoiding the confusion and the clashes that ensue when fifty-seven different versions of red and blue are lined up side by side on dealers' shelves to the despair of the proprietor of a crowded store and the muddling of the customer.

In more ways than one is color restriction and rotation counted upon to benefit the dealer no less than the manufacturer. The idea of a snuggled color range in commodities fits in, of course, with the latest ideals of stock control, hand-to-mouth buying, and the highest possible rate of turnover. More than that, it is toasted as an aid to selling and a conserver of the time of sales people. Investigation has shown that most of the customers at retail are confused and checked in their buying impulses when confronted in a store with endless gradations of the same color. The housewife may not carry in her mind the exact shade of color which dominates her kitchen. If she is encouraged in the belief that color harmony depends on an exact match, she is liable to be assailed by doubt and uncertainty and may, in the end, make no purchase.

Advance Style Information

One of the prime advantages, for producers and distributors alike, in the program whereby colors "take turns" is that it would be known long in advance on what date the color cycle would shift and tradesmen at all levels would thus have ample time to adjust themselves for the color shake-up by reducing stocks, closing out in avoidance of a carry-over, etc. The value in this wise of advance information on style changes has been well illustrated in the automobile industry, where, by the by,

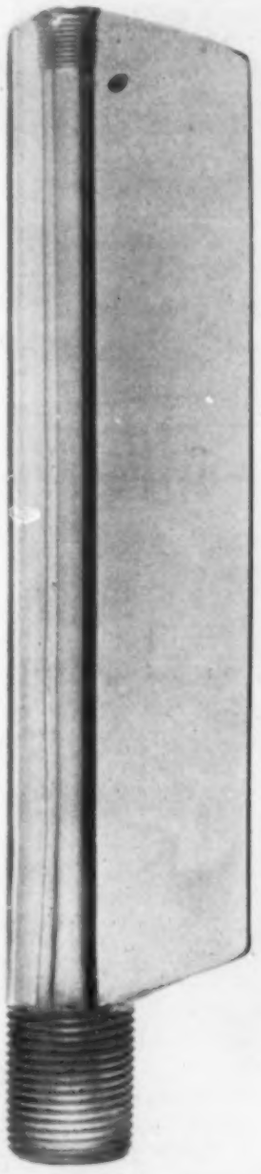
color changes are among the most conspicuous revisions to be discounted. Logically that same degree of preparedness should be possible in all industries that sell color if uniformity in color schedules was assured.

While there has been no malice aforethought in the project to rotate the colors in industry, by agreement of the respective groups there is an expectation in some quarters that the new plan would add yet more power to the sales arm of color. For several years past color has acted as the one most powerful stimulant to sales in hardware and house furnishing lines, plumbing, and any number of specialty fields. The call has been that of color abstractly as a brightening influence and a modernistic touch. Discrimination between colors has entered in only in so far as personal preferences have been consulted in the selection of colored wares. Like Eugene Field, who loved "any color so long as it is red," the average buyer of color has warmed to any burst of color that gave a thrill.

This easy-going pandering to the color appetite may be changed, if industry provides a well drilled color procession. Color, tuned to a calendar year or a sales season, will "date" the many classes of molded products that rank as long-lived merchandise. Members of the trade may find, just here, the answer for their complaints of old, that many perfected, standard items could not be redesigned frequently enough to coax reorders before the articles were worn out. Color rotation, far more than color itself, is due to inject obsolescence into articles physically capable of long service. The advent of color as such made one renewal necessary for the householder ambitious to be considered up to date. Color rotation will drive the color converts into more or less frequent replacement in proportion as the individual consumer takes pride in being, colorwise, in step with the times.

Airplane Gasoline Gauge Molded of Phenol Resin

IN the construction of the modern airplane, engineers have endeavored to utilize more and more, materials which in addition to possessing high tensile strength, and general mechanical toughness, and rigidity, are non-inflammable and non-corroding under the severe service conditions imposed. There is an additional factor, namely, lightness in weight. It is the foregoing reasons which have led to the increasing adoption of phenol resinoid materials to replace aircraft parts formerly made of metal or wood. There are of course some elements of aircraft structure wherein the use of plastics is not practical at present and may never be possible; especially is this true of the airplane engine.



By courtesy of Bakelite Corp.

The newest and at the same time, one of the most interesting applications of phenol resinoid material in the airplane, is the transparent gasoline gauge illustrated herewith. The device is made from clear resinoid material, and this construction is said to possess certain advantages over glass and celluloid, particularly in the matter of mechanical strength and non-inflammability respectively. An additional detail of interest is found in the fact that the gauge bears on external and internal thread located at the respective ends. The device is about 9" long, and rectangular, and has a cross-section somewhat resembling the segment of a circle. In other words, the gauge is quite uniform throughout its length, but whereas, one side is 7/8" in thickness, the other tapers to a relatively thin edge. The advantage of this latter construction becomes clearer when it is explained that the gauge as installed on the airplane wing presents the sharp edge forward to the wind. The boring to form the gauge proper in which the gasoline level is indicated runs lengthwise of the device, and is about 1/4" in diameter.

As installed on the plane the gasoline gauge by means of the external thread at one end is screwed into a housing in the airplane wing, thereby connecting directly with the gasoline tank (contained within the wing). A plug adapted to the internal thread at the outer end of the gauge serves as a seal.

Looking Ahead

Rapid development discloses new vistas in molding art of the near future. Keener competition in view.

By H. S. Spencer
General Plastics, Inc.

Molding Furniture, musical instruments, typewriter frames, automobile bodies, and other large articles.

THE rapid strides made in the molding of phenolic plastics during the past two years, will be surpassed in the next two, and the molder of 1930 will be handling a greater volume of business with many new applications of much more intricate design and pieces of much greater size than those that are generally considered today as difficult or large sized pieces.

In the early days the application of phenolic molded products was limited almost exclusively to those applications where no other known product could be used on account of limitations in the necessary physical, electrical or chemical resisting properties. This was due to the higher cost as compared to other materials which could be cast molded or cut into the shapes required. Rapid strides, however, have been made and today the cost of the phenolic molding materials and costs of molding and other operations, have been reduced to such an extent that the finished molded articles are now competitive with many other products which they are replacing.

Phenol Resins Replace Other Materials

Phenolic resinoids have already, on account of their mechanical resistance, replaced porcelain, wood, rubber, shellac molding compounds, cold molded compounds and other materials; for electrical resistance, it has replaced other molding compounds and machined insulating parts, for protection against, corrosion, it has replaced metal, etc.; special shock resisting phenolic plastics have replaced metal parts to stand up under the monkey wrench and pounding of the garage man's hammer, longer than nuts formerly used in battery terminals.

With increase in production, greater ingenuity of the molders and better production methods, costs are constantly decreasing so that this factor which at first was the greatest limiting factor in the use of this class of material, is now becoming of less and less importance.

New Molded Articles

Many new industrial forms and parts are being developed and will be developed. Ten years ago who would have thought of the possibility of molded electric switch plates being marketed successfully in competition to the brass plates or of the possibility of molded clock cases, door knobs, chair arms and many other articles, and yet these are being successfully marketed today at prices entirely consistent with competitive materials.

The list of present applications of these materials, is becoming almost unlimited and yet is increasing every day.

Among the new applications that can be now foreseen, will be typewriter and adding machine frames, bank tellers' change window counters. Molded toys will be in evidence. The number of novelties will have greatly increased. Kitchen utensil wood parts, will be entirely replaced with the more practical and longer lived molded parts, and many more such applications.

There will be further developments in the molding art to make possible, more intricate designs and the molding of larger pieces.

Among the new possible applications, calling for larger equipment, will undoubtedly be the molded automobile body made from a laminated stock eliminating rattles and squeaks. Automobile wheels made of laminated stock instead of steel, will give the strength of steel disc wheels, with the flexibility of the wooden spokes.

Furniture parts will be made; if aluminum chairs can be made, so can phenolic plastic chairs be molded, and they will have the permanent color of the solid molded part. Many other furniture parts will follow, as overstuffed chair and couch legs and arms, musical instrument sound boards and other parts, theatre seat arm rests, stool seats, and chair seats as used in department stores, soda fountains, schools, etc.

Many new industrial forms will be developed. Electric switch boxes and measuring instruments in greater number and in larger variety, will be molded. The print shop, cotton mills, shoe manufacturers and others will also require a larger number of molded parts.

The molders of 1930 will use larger and greater number of automatic presses and will get greater production at less cost through plants that will be more scientifically operated.

Precise Specification Possible

The manufacturers of molding compound and the custom molders, at least in the more technical industrial applications, will be rendering a more highly developed engineering service and the molder will undoubtedly receive many of his jobs with

(*Please turn to page 55*)

Miners' Lamp Principle Given Broad Field

"LIGHTING the way wherever you look" is the function of a novel and useful electrical device being made by the Nenzel Manufacturing Company, Los Angeles, Calif. In utility it stands midway, or perhaps definitely beyond the familiar miner's lamp, and the usual hand flashlight. The outfit includes a compact lens and bulb mounting, constituting the light-proper, which is worn on the forehead by means of an elastic head strap. A hook at the top of the lamp housing also permits of attachment to belt or pocket if desired. A suitable length of cord with control switch centrally located connects with a small battery case containing three separate unit dry cells.

The chief purpose of the new device is to provide portable directed illumination, leaving both hands of the user free to engage in such work as the changing of a tire, the reading of a map at night, or the performing of a surgical operation. The latter use suggests a broad field of service in the work of the physician or dentist who has frequent need for a forehead light which will function efficiently while both of his hands are free for the handling of instruments or other manipulation. Bakelite construction is embodied in the light housing, and in the switch. The choice of material, according to the manufacturers was based on low specific gravity, high durability, non-conductivity, and heat insulation properties. The manufacturers have found a considerable demand existing for a light which could be worn on the forehead giving optimum directed illumination, and yet with no discomfort caused by heating of the housing unit.

Another convenience is the location of a snap off and on switch midway on the cord between light and battery. In many such devices the switch is on the battery itself. By using phenol resinoid molding material for the switch, simplicity of construction was achieved, and at the same time good insulation secured. It should be stated further that the use of the lamp is not limited to operation with dry batteries. It can also be used in connection with re-chargeable batteries, or directly with the house current, if a small transformer is inserted in the circuit.

Being fully aware of the number of electrical doodabs and novelties that are annually produced, and often responsive to only very slight existing industrial or domestic need, the present light must be cited as something quite different. It seems assured of a wide application by all who have found previous head lamps inadequate, or uncomfortable.

New Booklet on Casein Published by Karolith Corp.

THE user or prospective user of casein plastic stock material chould find the new booklet distributed by the Karolith Corporation a handy and instructive guide. It describes Karolith, all its properties and uses, the methods used to fabricate finished articles from it and the equipment required for this purpose. Numerous illustrations give an idea of the beautiful and useful articles which can be manufactured out of casein sheets, rods and tubes.

Physical, mechanical and chemical properties of Karolith are fully described, especially useful to the designer or estimator being the tables of sizes, thicknesses and weights of the various stock materials. The man in the shop will find interesting information in the section devoted to Handling and Working. This expands upon storing, types of tools, tool speeds, methods of softening, bending, shaping and blanking. Another section and one to which much space is devoted, deals with a number of finishing methods used in producing desirable effects in casein articles. These include coating, glueing, etching, sandblasting and printing.

British Casein Products Industry

SOME interesting information regarding the progress of Erinoid, Ltd., was made public at the thirteenth annual meeting of this undertaking, which has just been held in London. Andrew Binnie, the chairman, said that the sales for the year exceeded those of the previous year by as much as 157 tons—a very substantial increase in so light a material as erinoid. In the course of the year selling prices after improving were depressed by foreign competition and remained at a low level. The effect of the dry Summer on the pasture lands in France made it necessary to provide feeding stuffs for the cows. As a result there has been an entirely unavoidable rise in the cost to the company of the special casein material which is the basis of the erinoid process. Under these adverse conditions, Mr. Binnie said that it was a matter for congratulation that in these difficult times the firm had been able to increase its sales and profits. The net profits for the year were greater than those of the preceding year by £4,199 ($20,995). Of this sum £1,647 ($8.235) is due to an increase in the trading profits. The increase in trading profits and transfer fees amounts to £1,726 ($8.630), the net savings to £2,473 ($12,365). Taken together they account for the net increase of £4,199 in profits.

The shares in the French company are included among the "floating assets." This particular floating asset is, in itself, however, to a large extent represented by fixed as well as floating assets. The conditions under which the French undertaking works offer a very interesting contrast, for there is a very high tariff on material such as erinoid going into France. There is keen internal competition, but the French organization is earning good profits and is now well established.

Owing to the increase in sales last year the profits of the French company became locked up in increased book debts and stocks. As a consequence, although the profits after taxation admitted of a dividend, the French directors prudently refrained from declaring one, so as to maintain a liquid position. Since then the company has made still more rapid progress, and an interim dividend at the rate of 10 per cent per annum was declared in respect of the current year. In order to release the profits for the purposes of the final dividend, it may prove expedient to issue additional capital, and this matter is being considered by the French board.

Mr. Binnie stated that the firm's general manager paid a visit to the factory and offices of the Erinoid Company of America a few months ago and reported that the manufactured material was of the same high quality as that produced in England and in France.

The use of celluloid is not so severely regulated in the United States as it is in the United Kingdom and consequently enters into greater competition with casein products. The American company is, however, working on orders which are taxing its factory to capacity.

In Britain erinoid sales continue to improve, and Mr. Binnie does not think prices are likely to sag, but may improve. In face of keen competition a solid business has been created and the firm looks to the future with confidence.

During the year a vacancy arose on the board owing to the death of Mr. Beck. Mr. Beck's services were highly valued by the company and it has been found difficult to replace him. A. E. Parker, secretary of the company, however, has been appointed to fill the vacancy. Mr. Parker has been connected with the company for many years and it is thought that he will prove a very efficient director.

Mr. Binnie closed the meeting by moving the payment of a final dividend of 4 per cent, making 7 per cent, less tax, for the year.

The Autopoint Pencil

THE mechanical pencil illustrated here, and recently patented, is an addition to the ever-increasing number of these articles made in part of one or another plastic substance. The present example, invented by Mr. Frank C. Deli, is manufactured by the Autopoint Company of Chicago.

The novel feature in the pencil consists of the formation of lateral projections, corresponding to threads, in the lead-propelling stem, which projections engage in the helical grooves in the lead tube. The projections are pressed out by means of a die, the stem stock having body enough to permit pressing without undue weakening at that point.

The body of the pencil is molded in Bakelite in two halves and then cemented together to form an integral cylindrical barrel, by means of heat and pressure. The barrel has cavities for reserve leads and an eraser cap at the upper end. The lower portion is recessed to receive the propelling mechanism and the lead tip.

How We Adapt Our Advertising To Each New Specialty

By J. C. Keran *

Advertising Manager, Harvey Hubbel, Inc.

MANUFACTURERS who produce large quantities of specialty items, like ourselves, have among their major problems the task of effectively tying-up production and advertising. This is due chiefly to the fact that most plants are not geared to take care of any and all unusual demands made on their specialty production and therefore cannot lay out an effective program aimed to concentrate advertising where it will do most good. Sometimes this lack of proper timing between production and advertising is due only to lack of planning however.

For the last two years we have been making our advertising progressively effective, through a program so constructed that it can be applied to any specialty that comes along (our line today is made up of approximately 3,000 items), and it can be used to reach jobbers, contractors, builders, architects and dealers with a maximum of return for money spent.

Elasticity In Manufacture

Our plan has its basis in a factory condition which permits us to take on any specific requirement. This elasticity, which allows us to take quick care of any new condition in any of our fields, is due to increases in machinery types and the adaptation of new principles. I need not touch here on this versatility of manufacture other than to emphasize that where many companies can gear their production of standard lines to varying trade needs, we are able in a comparable manner to gear our production of electrical specialties to varying demands.

This versatility has been acquired comparatively recently, and with it has grown our advertising and sales promotion plan which backs production to an extent hitherto possible only in staple lines. In the main the plan consists of four parts.

Salesmen Abreast of Factory

The first involves the sending of samples and letters to our salesmen to keep them abreast of factory activities. The importance of disseminating this information becomes apparent when you consider that within the last year our president, Harvey Hubbell, Jr., has invented and put into production about sixty-five of his own ideas, many of them labor-saving devices on our own machines. This sending out of news takes on further importance when you also realize that such industries as the radio and automotive are constantly demanding new electric equipment to keep them fully modernized. Our salesmen must keep in constant touch with such details.

Second comes a complete advertising and merchandising campaign to the trade, part of which I shall go into shortly.

Third, and very important in our minds because we feel it largely concentrates our general advertising, is a direct-mail-campaign which goes semi-monthly to jobbers, dealers, builders and architects.

Fourth is the follow-up work of our salesmen. This involves letters from the home office with duplicates of mail material sent to the salesmen's territories along with specific inquiries from each area. It further involves the turning over to each man of return cards and coupons from direct-mail letters and keyed advertisements, these leads being followed through by him to a definite yes-no conclusion. In one section we have had 100 per cent orders from this follow-through.

A recent campaign on Hubbell screwless plates illustrates how we follow out our plan with any one specialty. Although most of our plans start at the first of the year, because screwless plates were a very recent addition to our line and offered unusual possibilities for sales we began their campaign about February of last year, getting into full swing in April and May.

I need not go into the detail of our first step, that of sending letters and samples to salesmen. But I shall touch on the second step to show how we strive to concentrate the effect of our periodical advertising by making a progressively strong appeal to the market we wish to reach. Let me limit it, for purposes of illustration, to one series which ran in three publications reaching architects and builders.

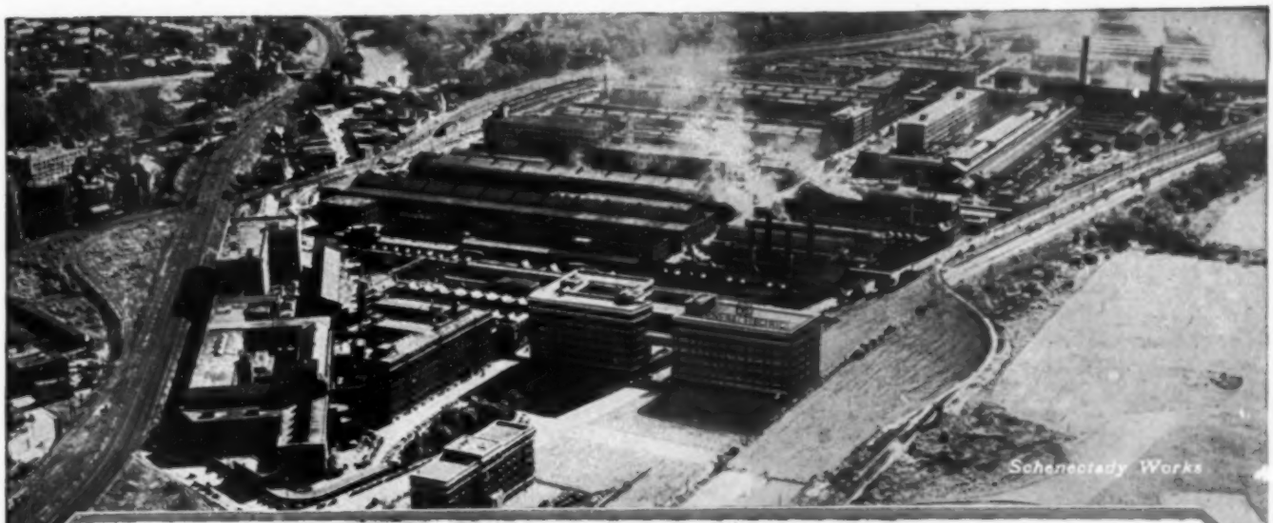
New Product: New Advertising

Several years ago Mr. Hubbell conceived the idea for an electric switch plate which would fit flat against the home wall. Experiments followed which resulted in the development of a Bakelite plate of highest possible insulation, which could be attached without any disfiguring screws, which could be placed in position after all painting and papering had been done, and which could be made in colors to harmonize with the individual room's decorative scheme.

(*Please turn to page 51*)

*Reprinted from Printer's Ink

A dependable, permanent source of supply



In these mighty workshops of General Electric, millions of pieces of Textolite molded have been produced. And production to-day is greater than ever before.

Here is a supply available for decades; a responsible, comprehensive organization; a reliable source of highest-grade materials.

These plants are backed by the great resources of General Electric; by the famed research laboratories; and by unexcelled facilities for service.

For complete satisfaction in the use of custom-molded parts, specify G-E Textolite molded.

GE Textolite Molded

885-15

GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y., SALES OFFICES IN PRINCIPAL CITIES

NEWS OF THE INDUSTRY

Domestic Exports of Pyroxylin Products, From the United States, by Countries.

August, 1928

Countries	Sheets, rods or tubes Pounds	Sheets, rods or tubes Dollars	Manufacturers Pounds	Manufacturers Dollars
Denmark	.....	.....	8	60
France	.....	.....	47	140
Germany	974	1,299	537	288
Italy	1,075	918	.....	.....
Netherlands	.....	.....	11	110
Sweden	187	130	.....	.....
United Kingdom	80,181	39,535	413	1,052
Canada	187,240	137,549	17,398	32,532
B. Honduras	.....	.....	2	4
Guatemala	17	23	555	1,061
Honduras	.....	.....	19	77
Nicaragua	18	39	33	256
Panama	.....	.....	108	238
Salvador	.....	.....	40	118
Mexico	369	290	1,996	2,711
Newfoundland & Lab.	18	20	73	247
Bermudas	20	48	.....	.....
Trinidad & Tobago	.....	.....	40	119
Other B. W. Indies	.....	.....	45	50
Cuba	1,565	1,542	442	1,031
Dom. Republic	.....	.....	118	280
Netherland W. Indies	.....	.....	2,018	310
Argentina	219	150	60	146
Brazil	1,506	509	.....	.....
Chile	.....	.....	225	470
Colombia	.....	.....	327	910
Peru	.....	.....	12	77
Uruguay	.....	.....	36	25
Ceylon	34	39	.....	.....
Philippine Is.	2,231	2,282	166	222
Australia	3,349	2,365	18,244	16,904
N. Zealand	.....	.....	882	1,447
Union of South Afr.	.....	.....	174	254
Total	279,003	186,738	44,029	61,139
Shipments from U. S. to:				
Hawaii	46	95	662	933
Porto Rico	66	38	2,340	1,757

THE F. J. Stokes Machine Co. of Philadelphia has recently perfected and placed on the market a preform press which turns out a "ball" preform that can be fed into the molding press by gravity,—just rolled in. It is claimed that this press turns out the roundest ball ever made on a tablet machine and that the preform, unlike the output of presses designed for similar purposes in the past, rolls **straight** into the feeding mechanism, saving time and labor on big production jobs.

The normal speed of the press is 250 to 500 preforms per minute, depending on the size and model, and customers are reported to have doubled this capacity in special cases without damaging the machine.

Production of preforms by this method of the proper size, weight and density, and in a shape to feed by gravity, has been adopted by several of the larger manufacturers of molded parts and can be used advantageously, it is stated, by any molder for quantity output.

PAUL C. TIETZ, formerly president of Imperial Molded Products Corp., Chicago, Ill., has become associated with Schneider Bros. Inc., 308 N. Sheldon St., Chicago, Ill., as their Consulting Engineer, and will devote his entire attention to engineering problems, and outside engineering relations, regarding Plastic molding fields.

MONSANTO Chemical Works in St. Louis announces that Mr. John D. Gillis, formerly President of John T. Milliken & Company of St. Louis, which firm was recently absorbed by the Abbott Laboratories of Chicago, has joined their Executive Staff as Assistant to the President.

MR. Arthur J. Norton has joined the research staff of General Plastics, Inc., at North Tonawanda, New York. Mr. Norton formerly held an executive position with Merck and Company, manufacturing chemists, at Newark, New Jersey. Mr. Norton was previously with Powers, Weightman, Rosengarten.

Strong Opposition to Marking Imported Rubber Manufactures in Britain

A STANDING Committee appointed by the British Board of Trade is now considering an application made by the India Rubber Manufacturers' Association, Ltd, for compulsory marking of imported rubber manufactures. An agreement has been reached by all parties concerned, subject to the views of the Committee, that certain articles should be unmarked, including telephone earpieces and mouthpieces, and articles made of ebonite, with certain exceptions.

In evidence before the Committee, Henry Clay, departmental superintendent of the North British Rubber Co., Ltd., Edinburgh, said that it was difficult to tell whether an unmarked comb was British or foreign. He said that by marking the word "Military" on combs it was intended to convey that they were British made, which caused counsel to observe: "Oh, I should have thought it meant that such combs were used by the British Military."

It is satisfactory to note that this agreement has been reached, for "ebonite, vulcanite, and manufactures thereof" covering an amazingly wide range of goods, ebonite being the raw material of many industries. For example, the applicants were asking for the marking of rods and tubes, but these are the raw material of fountain-pen makers, ebonite pipe stems, the raw material for brier pipe manufacturers, and accumulator boxes.

The fiercest opposition to the application was anticipated from the hard rubber section, so that the agreement will smooth over any anticipated struggle. It is said that from 85 to 100 per cent of the classes of articles which fall within this group are raw materials to manufacturers in the United Kingdom, who already know their origin, while the markings which the applicants suggested would be costly and in many cases impracticable. In the case of certain articles expensive molds are in use, and the addition of the proposed indicative words would entail the scrapping of these and the production of new ones at unreasonable cost. The only purchasers of pipe stems are pipe manufacturers who know the origin of the stems they buy. They buy them nearly all in the "rough," and put a good deal of labor into the polishing, finishing and fitting. If, in using foreign ebonite, they have to endure the word "foreign" on the stem it is obvious that this would brand the whole pipe as foreign in the eyes of the purchaser in Britain or abroad, and thus be misleading. An order for the branding of pipe stems in this way would be tantamount to prohibition of import.

A group of fountain pen manufacturers have submitted a statement to the Committee to the effect that if an order is made for the marking of imported vulcanite rods and tubes the result will be a substantial increase in the cost of these goods to them, and this, they say, would be equivalent to presenting Continental pen manufacturers with the export sales of cheap fountain pens. They say they cannot possibly use marked rods and tubes in the manufacture of fountain pens without first removing the identification mark, the serious cost of which they illustrate in detail.

Electrical storage battery manufacturers were among the chief protestants against the proposal to mark imported accumulator boxes. They find it necessary to have a free market for buying these, and a good many are imported from the United States. Those who buy them are already aware of their origin, and when they resell them it is merely as containers of a home-produced article.

A complication of another kind was anticipated with regard to the branding of vulcanite combs, and it was put to the Committee that it was unreasonable to single out in the comb trade a single class of combs which happen to be made of vulcanite.

Government's Relation To Business

IN a speech before the American National Retail Jewelers' Association convention at Dallas, Texas, Mr. H. C. Dunn of the Department of Commerce, pointed out the importance to business of knowledge of facts whereby waste and misdirected effort may be avoided. The Bureau of Foreign and Domestic Commerce concerns itself with the promotion of American commercial interests. It serves as an unbiased clearing house of commercial information such as can be obtained in the Department, in other branches of the Government, or through reports from nongovernmental sources. Inquiries and requests for information on individual business problems receive the benefit of existing research data, trade reports of the practice and experience in practically every phase of commerce, and the personal knowledge of the Bureau's staff in such fields as analysis of distribution costs, wholesale and retail, consumer demand, credit conditions, and industrial traffic management.

Association of Consulting Chemists and Chemical Engineers Organized

A GROUP of the leading professional consultants representative of all branches of chemistry and chemical engineering met at the Chemists' Club in New York to perfect the organization of the Association of Consulting Chemists and Chemical Engineers.

Dr. Alexander O. Gettler emphasized the importance to the public of the following points in the Code of Ethics: "Every individual on entering the Association of Consulting Chemists and Chemical Engineers, and thereby becoming entitled to full professional membership, incurs an obligation to advance the science and art of chemistry and chemical engineering, to guard and uphold its high standard of honor, and to conform to the principles of professional conduct. He shall refrain from associating with or allowing the use of his name by any enterprise of questionable character. If in his opinion, work requested of him by clients seems to present improbability of successful results, he shall so advise before undertaking the work. He shall be conservative in all estimates, reports, testimony, etc., and especially so if these are in connection with the promotion of a business enterprise. He shall be diligent in exposing and opposing such errors and frauds as his special knowledge enables him to recognize."

As stated by Dr. Louis P. Hammett in discussing the report of the Committee on Constitution, the objects of the Organization are: (By all proper means to advance the science and practice of consulting chemistry and chemical

engineering; to further the service of the profession of its clients, to the public, and to all branches of the Government; and to promote friendly intercourse and cooperation among its members so that their welfare be furthered, and the highest ethical standards of the profession be maintained".

During the discussion of the proposed Constitution Dr. D. P. Morgan, Jr., said: "In order that American industry may maintain its leadership in this chemical age it should have the unstinted assistance of every branch of the important profession of chemistry and especially the consultants. Such cooperation, I believe, can best be made available by united effort efficiently directed and we, the consulting chemists of our country should, and, in my opinion, will earnestly strive to aid through the medium of organization the ever growing number who are more and more realizing that American supremacy can best be upheld through the creative possibilities of modern chemistry practically applied and expertly directed".

"The reason industrial progress in Germany has been so rapid", said Dr. Alvin C. Purdy, "'while no doubt partly the result of constant and thorough application is, nevertheless, largely due to the fact that over there they constantly draw upon chemical engineering knowledge for help in every kind of industry, while here many of our business men are still under the spell of the delusion that chemistry is only helpful where chemicals and drugs are concerned. As a matter of fact many of our alert business men now realize the versatility of the Chemical Engineer who perfects old, and creates new materials; who selects the most efficient equipment, recommends better and less costly raw materials; and simplifies processes. It is

he who turns waste nuisances into profitable by-products and it is his advice that is more and more being sought and relied upon not only by industrialists but also by investors and bankers".

Others who spoke were: Louis O. Bergh, Russell Raynor, Irving C. Bull, Henry E. Cutts, Ludwig Saarbach, Joseph Geisler, Harry P. Trevithick, Clarence P. Harris, George H. Walden, Jr., and Emil Schlichting.

Following this general discussion the Constitution and By-Laws were unanimously adopted.

The following Officers were elected: President, Hal T. Beans of Columbia University; Vice President, Irving Hochstadter of Hochstadter Laboratories; Secretary, Clarence V. Ekroth of Ekroth Laboratories; and Treasurer, Jerome Alexander. The following were elected Directors: Charles V. Bacon, Frank C. Gephart, Robert Schwarz of Schwarz Laboratories, Albert M. Smoot of Ledoux & Co., Albert G. Stillwell of Stillwell Laboratories, Arthur W. Thomas of Columbia University, John Morris Weiss, of Weiss & Downs and Thomas A. Wright of Lucius Pitkin.

Additional information in regard to this Association is obtainable from the Secretary at 461 Eighth Avenue, New York, N. Y.

How We Adapt Our Advertising

(*Continued from page 46*)

The three features of this new specialty as we saw them were:

1. Perfect insulating surface.
2. Greater utility.
3. Unusual ability to lend itself to artistic design.

Having simplified the manufacturing problem, we went ahead to advertise the new screwless plates so as to bring out these three features and to build up their sales appeal progressively.

One Point Featured At a Time

In the first advertisement the headings and illustration featured our first point while copy brought in the others. The succeeding two advertisements of the series then played up point number two in headlines and illustrations, and then in copy we dwelt on all three featured points.

Point number three, in our plan of making advertising tell a story progressively, was brought out next by a colorful green illustration with a headline: "Plates to *exactly* match the walls or woodwork." The copy played up this feature but ended by touching on the insulation and greater utility features also.

In this way from month to month we continued our story, bringing out separate features separately, yet concentrating them all in each advertisement. We are concentrating on one device in this particular series instead of including allied switches, which you naturally might expect to be played up along with plates, because each screwless plate advertisement carries in it the idea of a switch or receptacle to go with the plate. This plate is interchangeable with the majority of switches but carries its own line of switches and receptacles that, with one exception, cannot be interchanged with other makes. Therefore we are bound to get business in switches and receptacles as a result of concentrating on the plate itself.

In a similar manner we are telling our various specialty stories through six to ten periodicals aimed to back a merchandising plan that reaches architects, electric contractors, builders, and dealers, with an educational idea presented in progressive stages.

The third part of our general plan—direct-mail work—springs naturally from this periodical advertising. We take reprints of our advertisements and with these and an accompanying letter, tell our story twice a month

to jobbers, dealers and preferred salesmen. Simply, we repeat our advertising story so strongly to our customers that they easily associate our reprints with the advertising they see in their business papers. We have verified the effect of this concentration through our salesmen. The momentum of such a concentrated tie-up is astonishing.

The letters we use with our reprints are, I think, unusual in that they incorporate an idea I developed a short time ago. Written on regular letter-size paper, they lead off with an interesting bit of news or comment that runs down a narrow center section of the sheet. Each side of this panel is cut, and through the flap so formed are inserted several advertisement reprints. In this way the reprints are firmly fastened to the letter, yet can be withdrawn easily whenever the recipient is ready to study them. Meanwhile they do not become mislaid. The comment that runs down the flap leads interestingly into a longer paragraph or two touching on the sales point we are emphasizing at the time. The letter is signed by H. W. Bliven, our sales manager.

Because each of these letters carries several reprints from various types of publication, when they go to the jobber they serve to build good-will while tying in specific advertising. For example, the first narrow panel text in one letter reads:

—somebody's getting it—

Of the $7,500,000,000 market for 1928, residences and dwellings represent 64%.

Every residence needs wiring materials.

Many of these residences will be equipped 100% Hubbell.

THE QUESTION IS—

"Are you getting your share of this business?"

This is followed below by:

Look these reprints over.

They are building up Hubbell prestige day by day which spells greater profit if you are in a position to give your customers Hubbell service.

What may we do further to assist you?

Among the reprints found under the flap of this letter is one

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of a coming advertisement on "Plates that match the finish of the walls! Women appreciate this feature in the homes you build." From this reprint the jobber learns what we are doing actively to further screwless plate sales to builders in his territory and he also becomes intimately acquainted with the advertising behind several other products.

Other letters touch on a single item only. Still another letter plays up simplification qualities in the Hubbell line, and so on over a list of sales points, each letter with its reprints to impress what the company is doing in advertising.

Again, this direct-mail effort leads directly into the fourth part of our general plan—follow-up work by salesmen.

First of all, salesmen are notified about each reprint mailing to their territory, the actual jobber, contractor or dealer letter being sent the salesmen with a typed slip giving date of posting. This keeps our men in touch with exactly what goes on and gives them something with which to open their sales talk when they make a call.

Second, with each letter to the trade there goes a return postcard. This serves three purposes. 1. It checks up the recipient's address when returned to our mailing department. 2. It usually brings a call for one or more of our many catalogs, which then goes out from our catalog department. 3. This same card then is sent to the salesman in the district from which it came and becomes an entree card that enables him to tie-up his visit to something tangible in which the jobber, dealer, architect or builder already has expressed a distinct interest.

Third, our salesmen are sent out to follow all leads which come to us through the return coupons included in all other special trade mailing pieces. Our men are instructed to get a definite yes or no reaction to whatever has been asked for through such coupons, a procedure which has been productive of from 50 to 75 per cent actual orders from original coupons all over the country. If this seems abnormally high, consider then returns from our concentration plan in the Pittsburgh and Philadelphia territory where our salesman has taken orders from every dealer, architect and jobber who has returned a coupon to our main office—100 per cent.

BUYERS' GUIDE

ACCUMULATORS
The Burroughs Co.
John J. Cavagnaro, Harrison, N. J.
The Dunning & Boschert Press Co. Inc.
Chas. F. Elmes Engineering Works
R. D. Wood
A. B. Farquhar

ALADDINITE
Aladdinite Co.

BAKELITE
Bakelite Corporation

BLOOD
Jungmann & Co.

CAMPHOR (Synthetic)
C. B. Peters Co.

CASEIN
Jungmann & Co.
T. M. Duche
American-British Chemical Supplies, Inc.

CASEIN PLASTICS
Aladdinite Co.
Karolith Corp.
Erinoid Co. of America

CELORON
Celoron Co.

CELLULOID
Celluloid Corp.

CELLULOSE ACETATE
E. W. Wiggins
American-British Chemical Supplies, Inc.

COLASTA
Colasta Co., Inc.

COTTON FLOCK
Peckham Mfg. Co.

CUSTOM MOULDERS
Connecticut Molded Products Corp., Meriden, Conn.
General Elec. Co.
Insulation Mfg. Co., Brooklyn, N. Y.
Kuhn & Jacob, Trenton, N. J.
Northern Indus. Chem. Co., Boston, Mass.
Norton Laboratories, Lockport, N. Y.
Recto Mfg. Co., Cincinnati, Ohio
Scranton Button Co., Scranton, Pa.
Shaw Insulator Co.
Siemon Co.
Jos. Stokes Rubber Co.

DIES
Standard Tool Co.

DUREZ
General Plastics Inc.

ERINOID
Erinoid Co. of America

FIBERLOID
Fiberloid Corp.

GLASS, SILVERED
Standard Mirror Co.
Tassi Bros.

GUMS
France, Campbell & Darling
Wm. H. Scheel

HEAT REGISTERING INSTRUMENTS
Cambridge Instrument Co.

HERCULITE
The Colasta Co.

HYDRAULIC EQUIPMENT
Fred S. Carver, New York City
John J. Cavagnaro, Harrison, N. J.
Evarts G Loomis Co.
Terkelsen Machine Co.
Burroughs Co., The,
Chas. F. Elmes Engineering Works
Southwark Foundry & Mach. Co.
Dunning & Boschert Press Co.
French Oil Mill Machinery Co.
A. B. Farquhar
R. D. Wood Corp.

KAROLITH
Karolith Corp.

LABELS
Economy Ticket & Label Co.

MANICURE ARTICLES
C. J. Bates & Sons, Chester, Conn.

MEASURING MACHINES
F. J. Stokes Mach. Co.

MIRRORS
Standard Mirror Co.
Tassi Bros.

MOLDING POWDERS
Bakelite Corp.
Celoron Co.
Colasta Co., Inc.
General Plastics., Inc.

PEARL COATING
Ukline Pearl Essence Co.
E. W. Wiggins

PHENOL RESINOIDS
Bakelite Corporation
General Plastics Inc.
Colasta Co., Inc.
Celoron Co.

PYROXYLIN PLASTICS
Fiberloid Corp.
Celluloid Corp.
Jos. H. Meyer Bros.
Du Pont Viscoloid Co.
E. W. Wiggins

ROLLING MACHINERY
Evarts G. Loomis Co.

SHELLAC
Wm. H. Scheel
Henry W. Peabody Co.

SWING JOINTS
Burroughs Co., The,
Evarts G. Loomis Co.
French Oil Machinery Co.
Flexo Supply Co.

TICKETS
Economy Ticket & Label Co.

TOOLS
Standard Tool Co.

TUMBLING
Rudolph R. Siebert

VARNISHES
Celoron Co.

VISCOLOID
Du Pont Viscoloid Co.

WOOD FLOUR
Acme Oil Co.
Becker Moore Co.
Burnett Co.
Jungmann & Co.

This is a carefully classified index of concerns who specialize in this industry and who advertise regularly in PLASTICS. Please mention PLASTICS when writing to these firms.

Too, when we recently sent out a special catalog on screwless plates with a letter and return card, more than 2,900 cards, costing the sender 2 cents postage, came back out of 7,000 mailed to the trade. And returns from the coupons in our magazine advertising also are exceptionally good. Yet our campaign is comparatively young. The same concentrated advertising and sales promotion policy which has been adapted to screwless plates has been worked out on industrial devices and heavy equipment as well.

Due in the main, as I see it, to an elastic manufacturing ability in specialty lines, on which is raised a preconceived advertising campaign whose elements are progressive — from dissemination of information for salesmen, to general advertising, to direct mail, to ultimate carried-through, follow-up work by salesmen on live prospects who have expressed themselves through the mail as open to do business with our company. All of these progressive elements in the plan for each Hubbell specialty being closely concentrated on essentials to achieve a single purpose—greater sales of our entire line.

Looking Ahead

(*Continued from page 42*)

specifications calling for a definite grade of molding compound on blue prints drawn up with a greater understanding of what can be accomplished through hot press molding and parts will be more closely drawn to molding and die making feasibility.

Phenolic molding materials will be classified for qualification just as steel is classified today.

Competition will be even keener and those who do not keep pace with progress, will fall behind or out of the picture entirely as they have always done in every industry everywhere. That fortunately or unfortunately, is the inevitable.

But the industry is becoming more stable and with a growing tendency toward co-operation among the molders in a standardization of trade practices, cost accounting, etc. and a growing confidence in each other, unfair practices which tend toward unreasonable price cutting are being gradually eliminated. This tends toward healthy competition which is beneficial to the industry.

That the phenolic plastics industry is a small boy today, can hardly be denied but that he is growing fast and promises to be a very big fellow before most of us realize it, just as our own and the neighbors' noisy youngsters will soon be courting each other and taking our places in politics, business and the accumulation of unpaid bills. It therefore, behooves us to keep in tune with the trend of the times for there is a big future ahead.